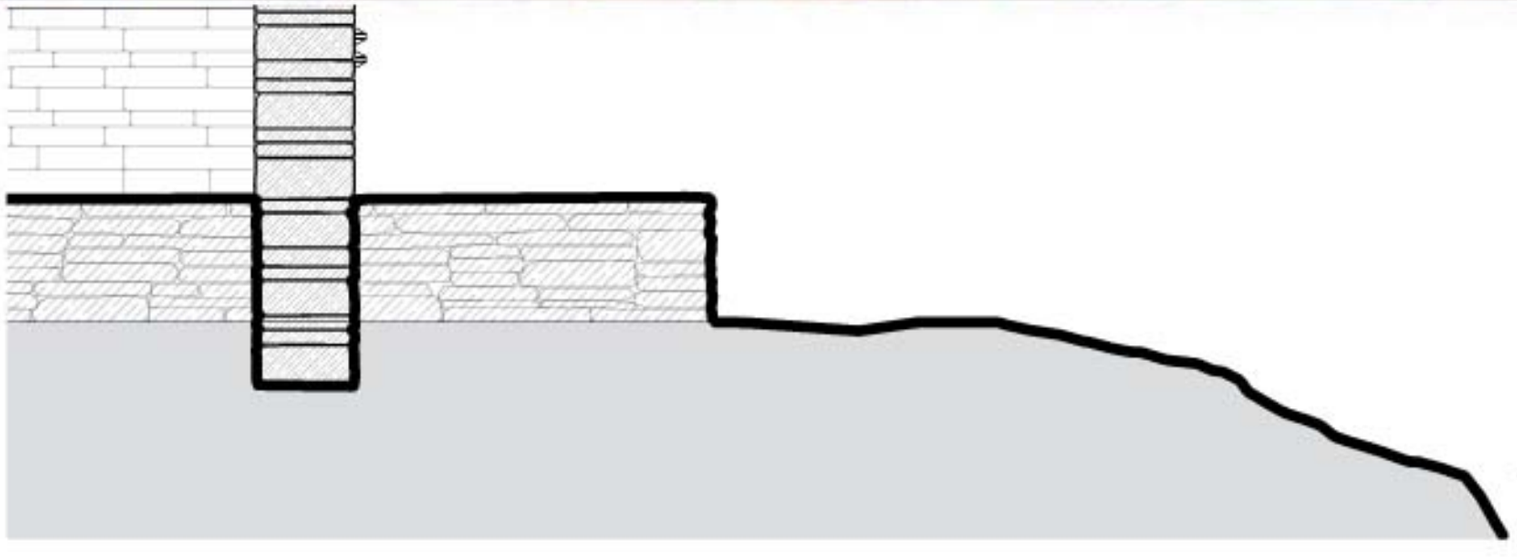
space making craft
volume 2

mātrā

Ways of Measuring
Vernacular Built Forms of Himachal Pradesh

Jay Thakkar
Skye Morrison



SID Research Cell
School of Interior Design
CEPT University
Ahmedabad, India

mātrā

Ways of Measuring Vernacular Built Forms of Himachal Pradesh

Authors

Jay Thakkar

Skye Morrison

Advisor
Kireet Patel

Research Assistant
Hardik Amin

Foreword by George Michell

SID Research Cell
School of Interior Design
CEPT University
Ahmedabad, India

mātrā

Ways of Measuring Vernacular Built Forms of Himachal Pradesh

CEPT University

Centre for Environmental Planning and Technology (CEPT) University, Ahmedabad, is a leading institution offering under-graduate and post-graduate programmes in the areas of natural and built environment and related disciplines under the Faculty of Architecture, Faculty of Technology, Faculty of Design and Faculty of Planning and Public Policy. CEPT University has been accorded the status of Scientific and Industrial Research Organization (SIRO) by Department of Scientific and Industrial Research, Government of India. Regarded as a Centre of Excellence in Design and Technical Education, the courses at CEPT University are recognized and approved by the All India Council for Technical Education as well as the Central and State Governments.

Faculty of Design: School of Interior Design (SID)

The School of Interior Design was established in 1991 as the premier Indian institution in the education of professional Interior Designers – one-of-a-kind for India offering - a full-time five-year extensive education program in Interior Design. Among the many disciplines related to the built environment, 'interiors' is the layer of built form connected to human interaction and practical activity. The design of interior environments in conjunction with the architectural form demands comprehensive and sensitive understanding of human needs. Interior Design expands beyond architecture to include many other disciplines. The primary purposes remain the same for all disciplines related to the built environment. These purposes are to improve the quality of life, increase productivity, protect the health, safety, and welfare of the public and reflect the cultural and aesthetic aspirations of the people using the space. Interior Design responds to social, cultural, artistic, economic, environmental, technological and political needs of the client and the society as a whole. To become an Interior Designer demands highly developed critical, analytical and conceptual thinking based on knowledge that is grounded in an understanding of the history of built form, a practical ability to design spaces as well as conducting original academic and field based research.

SID Research Cell

Research is the backbone of any developing creative discipline and forms a tangible link between academic and professional worlds. Interior Design, being a new specialized discipline, requires innovative research and publication to present new ideas and shape future academic curriculum and professional practice. The SID Research Cell was established to create a unique body of knowledge pertaining to the discipline of Interior Design especially as it is practiced in India. Four areas have been identified as the focus of our work: 'History, Theory and Criticism', 'Craft, Culture and Technology', 'Energy and Sustainability' and 'Bionic Sciences'. The SID Research Cell presents its results through the publication of books, monographs, and thesis papers, presentation of seminars and conferences and audio-visual training material. These initiatives will build a knowledge base specific to the field of Interior Design. The long-term goal of this research activity is to create a legacy of the history of the discipline and to formulate, support and guide post-graduate (Masters in Interior Architecture and Design) and doctoral level programs at the School of Interior Design, CEPT University, Ahmedabad.

Sir Ratan Tata Trust (SRTT)

Set up in 1919, SRTT is one of the pioneer institutions engaged in developmental and creative activities in India. Through its institutional grant making, the Trust supports efforts in the development of society. A major grant has been made to the School of Interior Design, CEPT University, Ahmedabad, towards enhancing research and dissemination activities at the SID Research Cell whilst building graduate curricula in Interior Design.

Jay Thakkar

Jay Thakkar is a full time faculty member of the School of Interior Design at CEPT University, in Ahmedabad, India. He teaches Design Studios – Graphic Design, Basic Design, and Furniture Design. He is a professional consultant in Visual Communication. He has worked on design projects in India and Britain, including the internationally reputed Indo-French project for the revitalization of the walled city of Ahmedabad.

Jay Thakkar has a Masters in Visual Communication from the Birmingham Institute of Art and Design (BIAD), United Kingdom (2004) and a Diploma in Interior Design from the School of Interior Design, CEPT University (2000). He received gold medals from the School of Interior Design, CEPT University and the Gujarat Institute for Civil Engineers and Architects (GICEA). Jay Thakkar is the author and designer of the book *"Nagsh: The Art of Wood Carving of Traditional Houses of Gujarat – Focus on Ornamentation"* (CEPT, 2004). This original research was the first publication of the SID Research Cell. He is passionate about Design Education, Visual Communication and exploring Indigenous Knowledge Systems. *Mātrā* is the result of his ability to work at the grass root level on the field with students and local people.

Jay Thakkar was the field guide and lead faculty for the 'Living with Craft' Program, which took place in Himachal Pradesh in 2005 and 2006 that formed the basis of this book *Mātrā: Ways of Measuring Vernacular Built Forms of Himachal Pradesh*. He was the Research Head of the *Mātrā* Team. He guided young designers working with digital software to create visualizations of vernacular built forms of Himachal Pradesh. His contribution to the content includes the holistic narrative of the research, structuring and evolving research analysis and sequencing of data.

Skye Morrison

Skye Morrison is a Canadian educator, researcher and designer with a life long interest in traditional crafts. She received her PhD in Folklore (Material Culture) from the University of Pennsylvania (1991), her MA in Design and Environmental Analysis from Cornell University (1976) and her Diploma in Design (Textiles) from Sheridan College, Canada (1972). She was a professor at Sheridan College School of Crafts and Design from 1978 to 2002 when she left full-time teaching to pursue research projects. Skye Morrison is an Adjunct Professor in the Faculty of Fine Arts at Concordia University, Montreal. In 2007, she had been an advisor to the SID Research Cell, MIAD program and to a PhD student at CEPT University, Ahmedabad.

Her love affair with India began in 1993 when she came as a visiting professor at the National Institute of Design in Ahmedabad. She has been a visiting faculty at MICA and NIFT. Her research and publications include: "Stitching Women's Lives: Sujuni and Khatwa from Bihar, India" (1999) for the Textile Museum of Canada, "Strings of a Timeless Tradition" and the film "Keepers of Flight" (2004) about the kite makers of Gujarat, and the film: "Thread has a Life of its Own, Aboriginal Women's Stitched Stories." (2004). Her recent article "Threads and Voices" was in Marg Magazine (2007), edited by Laila Tyabji. She is currently working on an exhibition of contemporary Indian narrative embroidery at the Museum of Costumes and Textiles in St. Lambert, Quebec, Canada.

Skye Morrison interviewed faculty and students who participated in 'Living with Craft' study trips to Himachal Pradesh and the *Mātrā* Team. As the storyteller, Skye Morrison combined narratives about the people of Himachal Pradesh, the students and faculty members of SID, vernacular built forms, measure drawings and craft practices to bring to life the indigenous architecture, interiors and material culture of Himachal Pradesh.

Contents

Part 1 Beginning of a journey

Living with Craft 13

In the beginning 13
The process: Mapping the journey 2005 17
The process continues: Mapping the journey 2006 21
SID Research Cell activities 25
Himachal Pradesh: A sense of place 28

Kath-khuni (Cator and Cribbage) construction technique 30
Seismic design 32

Part 2 Vernacular houses

***Kath-khuni* houses** 37

Finding home 37
Types of houses
The environment
Infrastructure
Public buildings and spaces
Common spaces
Roads and paths
Typology of houses 42
Variations
Orientation
Darbargadhs 48

Woodcarving integrated in *kath-khuni* built forms 59

Measure drawings of the *kath-khuni* houses 63

Shri. Manohar Das Lohlta House, Old Jubbal 64
Shri. Devinder Singh Chidgha House, Old Jubbal 70
Shri. Happi Singh Aukta House, Kiari 76
Shri. P. C. Aukta House, Old Jubbal 82

Living at home 95

Social use of spaces 95
Functions of living spaces 98
Ground floor
First floor
Second floor
Significant elements in making a home 109
Chulhas
Interior niches and storage elements
Transitional spaces 113

Portfolio and analysis of Aukta House 121

Part 3 Granaries

Granary – a shared storage 201

Finding storage in real time 201
Independent granaries 203
Independent granary features
Granaries within the houses 205

Measure drawings of a *wood-and-stone* granary 206

Shri. Mahender Singh Aukta granary, Old Jubbal 206

Part 4 Temples

Wooden and *wood-and-stone* temples 217

Finding a place for the Gods 217
Typology of wooden and *wood-and-stone* temples 231
Gable roof
Pent roof
Pent-and-Gable roof
Composite roof
Tower temple
Multi-tiered pyramidal roof

Measure drawings of a wooden temple 235

Shakti-Devi Temple, Chhatrari 235
Temple complex
Shakti-Devi Temple

Measure drawings of a *wood-and-stone* temple 249

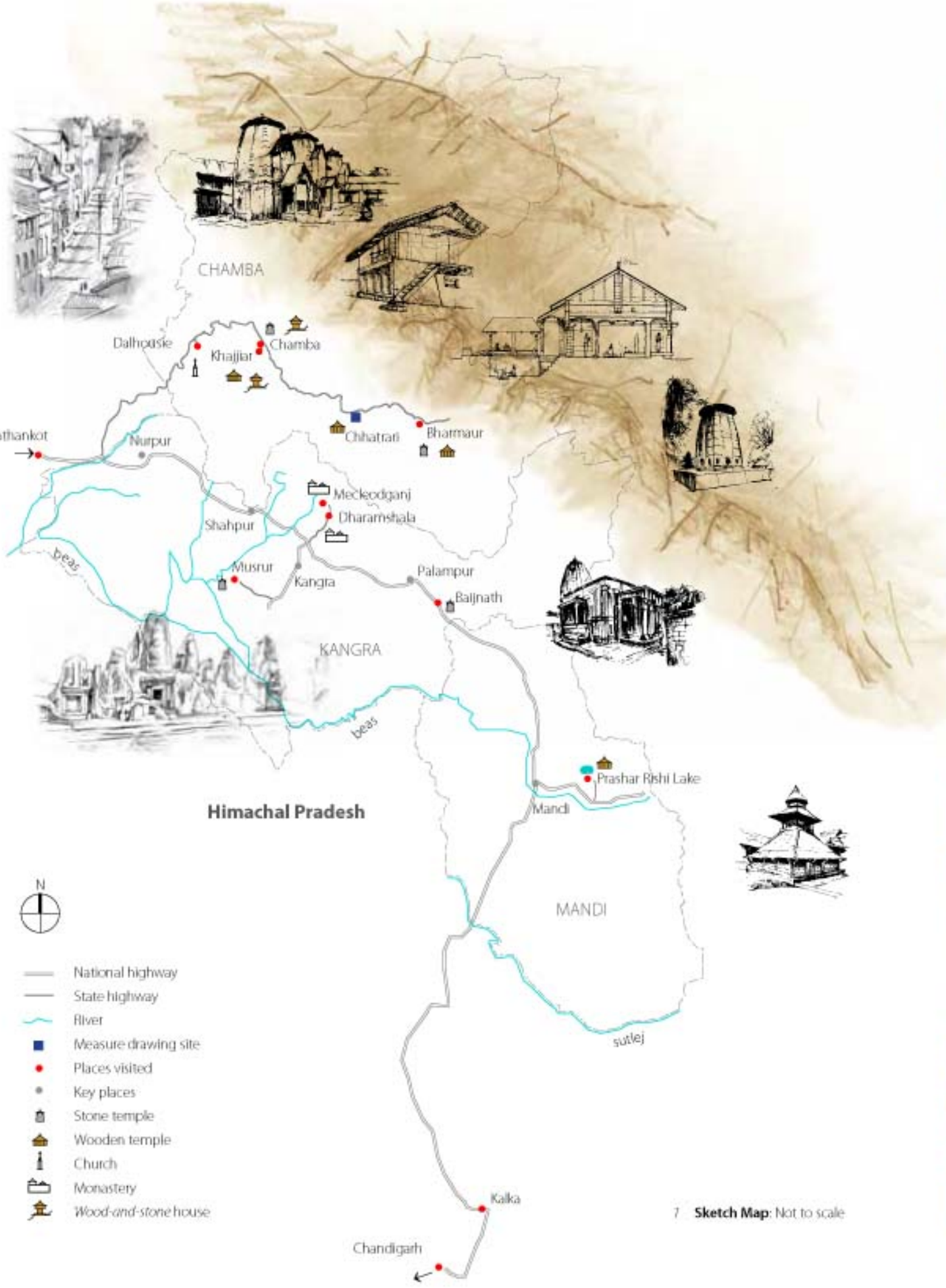
Folk Deity Temple, Kiari 249

Portfolio and analysis of Shakti-Devi Temple 253

Part 5 End of a journey

***Mātrā* – a performance** 295

Bibliography 307
Index 308



Dalhousie

Khajjiar

Chamba

Chhatrari

Bharmaur

Dharamshala

Baijnath

Musrur

Prashar Rishi Lake

7 **Sketch Map**: Not to scale

Living with Craft

Imagination is more important than knowledge – Albert Einstein

In the beginning

Wood, Stone, Mud and Grass. These are the materials used since time immemorial to create vernacular built forms in India. To know these built forms one needs to understand these materials and their natural environments. This is why the School of Interior Design at CEPT University, Ahmedabad, Gujarat has incorporated fieldwork and measure drawing into its curriculum.

To understand the roots of our culture, we travel away from cities to have first-hand experience of the people, time and space of remote rural places (figure 1). We ask students to make measure drawings of built forms as a tool for observing and experiencing a place and as a way to make meaningful interaction with locals. Conversation, sketching, photography and observation are further tools for a designer to understand the peculiarities of a new and different place. Sharing food and accommodation with local hosts is a way of discovering community values. This is an invitation to get inside spaces and to experience other ways of living.

Himachal Pradesh (figure 2) offers an opportunity to explore a true combination of two of the fundamental materials of built forms in India, wood and stone. In remote mountain villages, wood and stone form an interdependent, socially connected and highly artistic expression of folk culture in the forms of vernacular houses, granaries and temples. We want our students to experience built forms integrated in local environments, expressing the co-existence of humans and nature.

Experiential learning is a one of the key techniques to widen the perspective of Interior Designers. It is a way to see the 'whole cloth'[1] of a place. By 'whole cloth' we mean a cloth where the function, meaning, emotion and values are all contained in the piece. A shawl (figure 3) from Himachal Pradesh is a 'whole cloth.' It not only embodies the materials of the place where it comes from (sheep and goat wool, plant dyes and the wooden loom from the cedar trees) but also it represents in its' design, a world-view. The base is black, grey, white, the natural colours of sheep and goats and the shades of stone, slate and the snow of the mountains. The decorative bands of bright colours have their symbolism: red for life, blue for water and sky, green for growth and white for snow and clouds. They are organized in geometric patterns that parallel the Cator and Cribbage* construction of vernacular houses where they are woven. The shawl's bands are like the cross-members of sturdy wood intersecting with dry masonry stone. This is how a shawl and a *wood-and-stone* building reflect the same values and aesthetics of the community where they come from. They are characteristics that are unique to Himachal Pradesh.

As creative beings, humans shape the space where they live as well as respond to the forces of nature that impact their lives. The discipline of Interior Design creates human habitation taking in consideration the forces of nature and strives to find beauty, comfort, safety and sustainability. In order for students of Interior Design to understand this, it is imperative that they move outside the classroom and explore different types of habitable spaces. Not only do they learn to perceive these spaces by measuring, sketching, drawing and documenting, but also they get to know the people who have created them. Through field studies all over India the students broaden their outlook.

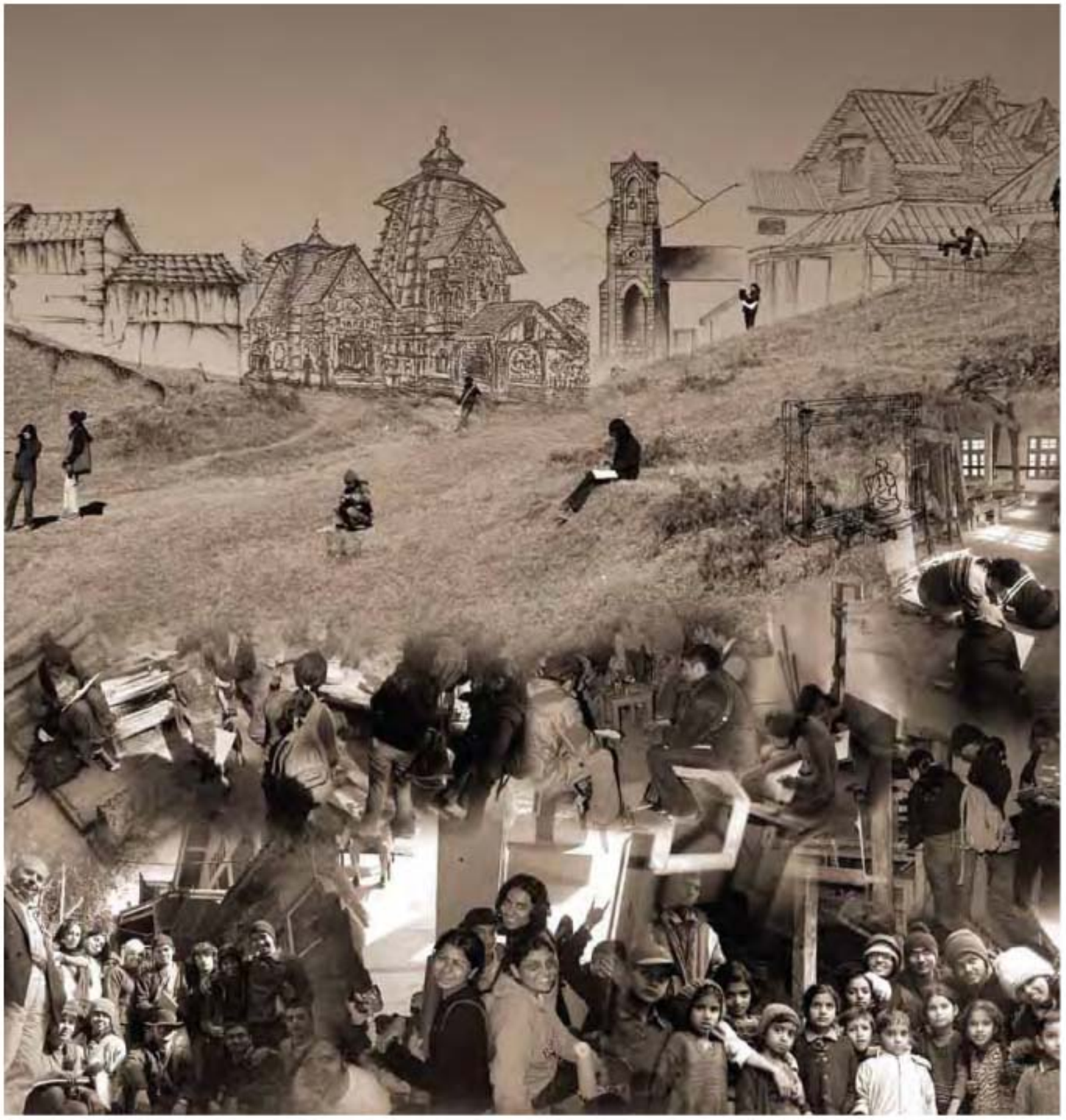
Senior faculty of SID, Kireet Patel describes the evolutionary process of creating 'Living with Craft' (Related Study Program) for students.

"In 1992, a 'Related Study Program' (RSP) called 'Living with Craft' was integrated into the course curriculum of the third semester. This program is an environmental exposure to the places in India where tradition is alive and people are making their own spaces. It is an interface of craft and design in a living tradition. We try to interact with people in their local built environments for two experiences.

* Refer page number 30 for details on *Kath-khuni* (Cator and Cribbage) construction.

1. (on previous page) **The road from Bharmaur Village to Chhatrari Temple, Chamba District, Himachal Pradesh.** Villages located on the mountains.

2. Sketch Map of Himachal Pradesh. Indicating the areas visited during the 'Living with Craft' study trips of SID in 2005 and 2006. Illustration: Katrin Müller



8

SID Research Cell activities

Two field trips to Himachal Pradesh provided the substance for our study. The discussions, critiques and reinvestigation of the measure drawings, sketches and photographs along with research on vernacular environments at the SID Research Cell initiated. This gave the *Mātrā* Team an insight into the richness of this empirical knowledge within this vernacular built forms as well as possibilities of its application in many areas of architecture and design.

Our first task was to digitize all of the hand drawn measure drawings created by the second year SID students. This process made the material more accurate and consistent. We were able to look at both field trips as one coherent body of information. Further, three-dimensional virtual models of vernacular built forms using Computer Aided Design software were created by the *Mātrā* Team at SID Research Cell, in the same way a traditional builder would have created real built forms in the local terrain. Gradually, as we collated and analysed the technical drawings (two- and three-dimensional) and sketches of vernacular built forms, we could perceive and understand patterns and the relation among the various built forms. These patterns are the consistent recurrence of evolving variations in types of built forms, spatial organization, usage of spaces and construction and joinery systems.

Two local built forms were chosen for the detailed analysis in our research – *wood-and-stone* Aukta House and a wooden Shakti-Devi Temple. The analysis of the three-dimensional illustrations led to the concept of deconstruction (disassembling and ordering the parts of a built form) and then reconstruction (demonstrating how it could be put back together). The results of this analysis strengthened our conclusions about the construction of these built forms and their usage. The results of this analysis is presented through a series of schematic sketches, digital illustrations, folded interior elevations, isometric and exploded views, sectional perspectives and rendered virtual three-dimensional models.

While the drawings and sketches were created, analysed and refined, the research was also conducted on the types of vernacular built forms and their construction methods, climate and seismic features of this area and the political, social and cultural issues that impact their sustainability. Our efforts were directed to holistically understand these indigenous built forms (figure 11). We called in the visiting faculty member of SID, Professor V. R. Shah, a structural engineer, to help us to understand the seismic implications on these vernacular built forms in the earthquake-prone mountainous region of Himachal Pradesh.

The *Mātrā* Team met regularly to discuss the overall themes of the project (figure 12). A strategy for presenting and structuring the information was critical. We start with the houses that form the major part of the vernacular built environment of Himachal Pradesh and are also our principal focus for a thorough understanding of the local built forms. This is followed by information on granaries, which echo the building patterns and provide deeper insights on importance of food and storage in this harsh environment. Temples, both large and small, constitute the last section of this study. They are the pinnacle of the local craft and construction practices and also an interface between indigenous and imported ideas and concepts. All together they demonstrate the coherent use of local materials, traditional construction techniques and craft practices in the creation of vernacular built environments.

12a

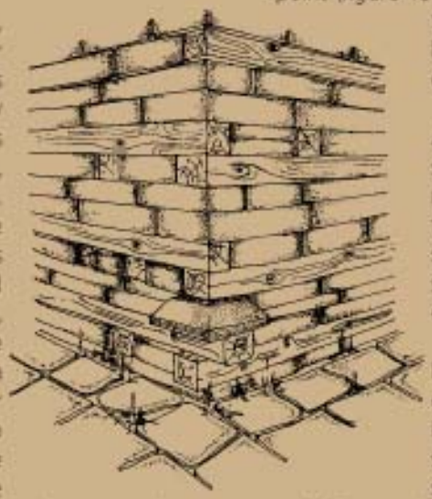
12b

12 (a, b). Framing the story, SID Research Cell, CEPT University. Jay Thakkar, Skye Morrison and Kireet Patel (left to right in figure 12a) create a visual narrative of the two research trips to Himachal Pradesh at the SID campus. This exercise was one of many discussions used to structure the project. Photograph: Jagrut Raval

Kath-khuni (Cator and Cribbage) construction technique

Kath-khuni is an indigenous *wood-and-stone* construction technique employed by all types of vernacular built forms we observed in the Sutlej valley of Himachal Pradesh. It is both practical and aesthetically pleasing, articulating local materials in a systematic process of layering. The inherent stability, flexibility and strength of *kath-khuni* buildings make them appropriate to their mountainous terrain that is prone to earthquakes.

In the Himachal Pradesh examples of *kath-khuni* buildings, the structural walls are made of deodar (mountain cedar wood) and slate stone (figure 19a) in what can be termed as 'composite construction'. The plinth is constructed entirely of stone. The base of the structural wall is two parallel layers of stones installed flat. Depending on the size of the stone, the gap in middle is filled with an infill of random rubble. The larger stones are stacked up on the outer edge and the corners of the wall to provide stability. Starting from this stone base, the wall is constructed by layering both wood and stone (figure 21). The materials are stacked horizontally, in alternating rows, parallel to the ground (figure 166). These side-by-side timber beams between layers of stone form a square or rectangular frame. The gap between these timber beams is also filled with an infill of rubble (figure 19b) to give mass and support to the frames. The timber frame is repeated upward with a stone layer in between. As the construction proceeds vertically, the height of the stone layer decreases and ultimately it is only the wood frame stacked on another wood frame (figure 178c) that completes the structural wall.



18

The stone wall at the base lends a heavy foundation to the building. The stones are stacked on each other without the use of mortar. Gravity is the glue that holds the stone in place. This technique is known as 'dry masonry'.

A benefit of this construction is that the stacking has flexibility that allows walls to adjust to the foundation. Because the sides of the stone slope slightly inward, any ground movement locks the structure more tightly together. This is important in earthquake-prone areas because the building must move with the ground's shift.

Slate shingles, which rest on the wooden framework complete and cap the building as the roof tiles. Though heavy, the slate shingles are made flexible by fixing them to the wooden framework with metal nails at a single pivot -point (figure 180). This allows them to adjust to rain and snow and shed the load of moisture, preventing it from coming into the building. Pivot-point fixing also helps to dissipate energy during earthquakes.

A peculiar feature of this *kath-khuni* construction is a single projecting carved stone in one (and sometimes more) corners of the house (figures 18, 20). Placed on the top of the first intersection of timber beams, it may have a structural purpose. It could also have cultural and religious significance as the 'corner-stone', since it is one of the few ornamented features of the houses that we studied.

In the harsh mountainous terrain, Cator and Cribbage construction is quick and efficient employing stone that is close at hand as well as rubble, an alternative to slow setting mortar. This construction does not require highly skilled carpenters or stonemasons or even specialized tools. Construction can take place in stages, whenever materials and labour are available. The local raw materials are not adversely affected by seasonal changes. Walls of considerably thinner section than normal stone walls can be made, getting maximum height with minimum material. There is rarely any wastage of materials and the means of construction are energy efficient. The infill rubble traps air within the walls creating an insulation zone. This prevents heat loss during the cold winters keeping the interiors spaces warm and allows them to remain cool during the hot summers. Locals, with access to raw materials and the support of family and community, can easily build their own house. Vernacular built forms employing *kath-khuni* construction are time-tested examples of living and breathing sustainable buildings.

---

18. Cornerstone and *kath-khuni* construction, Jubbal Village. This is a line drawing showing the corner of the ground floor level of a typical house with the layers of wood and stone including the protruding truncated pyramid-shaped cornerstone. Illustration: Devina Jesrani

19 (a, b). Contemporary *kath-khuni* construction, Pishali Village. A new house being built in Pishali, a work in progress (a). Indigenous building technology is alive in this excellent example of dry masonry *wood-and-stone* construction. Figure 19b is two parallel wooden crossbeams held in place by double dovetailed wooden member. The gap between the beams is filled with stone rubble acting as insulation and giving mass to the wall.

20. Shri. Devinder Singh Chidgha House, Old Jubbal Village. This is a corner junction of the ground floor structural wall showing *kath-khuni* wood and stone layers as well as the protruding cornerstone as depicted in figure 18.

21. *Kath-khuni* house, Dhagoli Village. This house exhibits a fine example of the ground floor with a wooden doorway having multiple frames, and an opening for the beehive above the door. The regular rhythmic patterning is like a woven Himachal shawl (refer figure 3). The headstone of the doorway is carved signifying the importance of the entrance. The hardware and chain (made of metal, which is difficult to procure and therefore significant) are used to lock the *gaushala* (animal shed) door.

19a

19b

20

21

27

26. (on previous page) **Stepped agricultural land on the hillside, Chhatrari Village.** The land going down a mountainside to a river valley has been cleared in a stepped and layered pattern for growing grains.

27. A typical village cluster, Dhagoli Village. This aerial view of the village show a Tower temple, community courtyard and a cluster of houses organically planned according to the terrain.

28. *Kath-khuni* house under construction, Pishali Village. Two SID students on the topmost wooden beams studying the construction of a new house. Photograph: Nishar Dantrelia

29. Supervising the construction, Pishali Village. Raw materials are stacked next to the construction site of the house that is adjacent to an existing *kath-khuni* house. The builder, who gave us permission to document his work, stands amid the materials. Photograph: Nishar Dantrelia

Kath-khuni houses

Finding home

When one comes to a new place and wants to understand the daily lives of the people, the best place to start is the home of the local people. Travelling through Himachal Pradesh, villages spring up like flowers through the cracks of an inhospitable terrain (figures 26, 27). They possess examples of vernacular built forms integrated with their environment. When SID team began their research into built forms, we thought that the *darbargadhs* (Princely homes) (figures 50 to 53) would be our focus. Social restrictions and conservative community standards limited our access to these magnificent structures. On the other hand, the local house owners joyfully allowed us to 'measure' their houses.

A villager wishing to build a house for a family will cut the necessary number of trees and collect slate stones from the immediate area; the most accessible source for the stone would be the riverbank. The use of the local materials is not only because they are strong and will withstand the diverse climate but also because they are 'at hand'. The local knowledge and expertise required to build a house is obtained from a network of family, village and regional specialists who are engaged in a social eco-system of exchange of goods and services. This system is part of a larger barter and exchange network with deep roots in the medieval history of the area. The house owner is intensely involved in the process of making a house, starting from sourcing raw materials, to the rituals and prayers performed before the construction, the process of building and until the completion of the project.

The SID team was lucky to find someone building a house in Pishali (figures 28, 29). Using the example of an unoccupied old house as his model for the new one, the owner took time to explain how the old built forms are a prototype for the new. He understood the rules of building a house that would fit into the village pattern. His values and practices are consistent and shared in the community. Wherever possible, he continued to use the local systems of acquisition and use of materials, skills and labour to complete the project. He wanted his house to belong to this place. Our task was measure drawing, sketching and documentation of village homes in tandem with recording our experiences of daily life of the villagers. From our findings, we have produced a set of building types, technical drawings, material inventory, some understanding of construction, records of the social use of space and finally an in-depth study of one *kath-khuni* house. By combining the experience of seeing a vernacular built form under construction with measure drawing existing houses, we can arrive at conclusions about what makes a good house in a mountain village.

28

29

Typology of houses

House is a space inhabited by people and their stories. The character of a Himachal vernacular house, the 'story unit' is basically a cuboid (figures 39, 40). The smallest houses are single cuboid stacked in two or three layers (ground level, first level, second level). The size of the house increases by placing cuboids side-by-side and then extending the larger rectangular units up by one or two levels (figures 37, 38). The largest house, where we made measure drawings, is three side-by-side stacked cuboids extending up three levels (figure 103). Closer examination of the interior spaces of this house revealed half levels and intermediate spaces not obvious from the external viewpoint (figure 192). Each house size is determined by capacity. This capacity is not only the size of the family but also the family's socio-economic status.

37

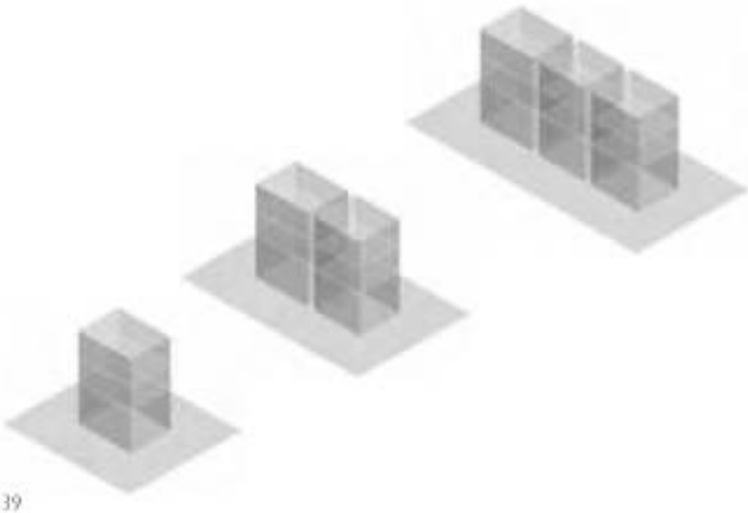
38

37. Front view of eight-cuboid module house, Upper Dhagoli Village. There are eight cuboids stacked beside and above each other forming the basic inner structure of this house. The shifts in patterning of layers of stone and wood, as well as irregular insertion of small doors and windows create non-aligned openings in the structural wall that assist in the seismic design.

38. Plinth and steps for animals and people, Jhaknoti Village. Different layers of stacked stones form a plinth for cows and steps to bring people around to entrances of the house while defining its outer footprint. This is another example of the multiple uses of transitional space. Photograph: Rajesh Sagara

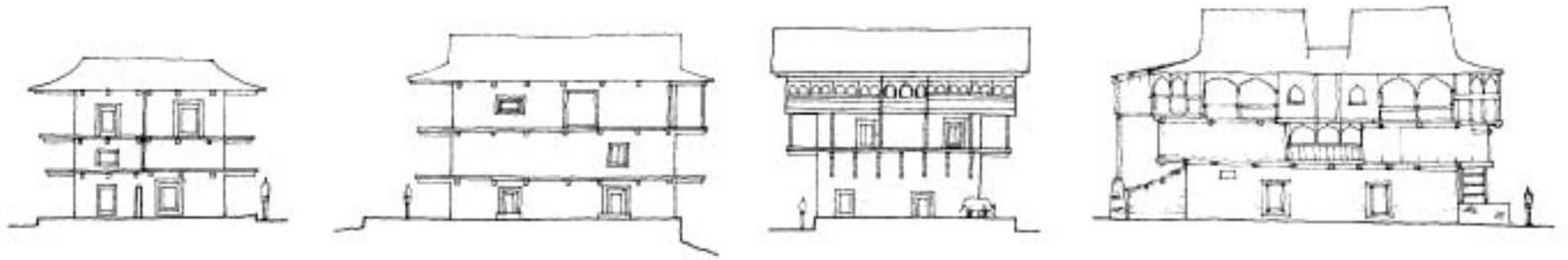
39. Schematic digital illustration of stacking of cuboids. These cuboid modules represent the units of the spaces in the *kath-khuni* built forms we measure drew. Starting with the smallest house, with just three cuboids to the large houses with nine or more cuboids.

40 (a to m). Typology of *kath-khuni* houses, Himachal Pradesh. These sketched views of types of *kath-khuni* houses are all front elevations. The human figure indicates the scale. The schematic of cuboid-modules under each house represents the configuration of the volumes within them.

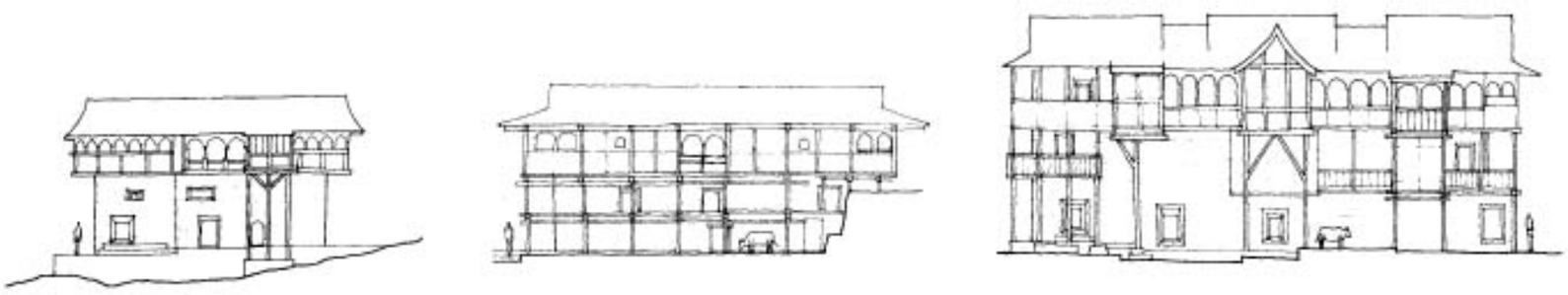


39

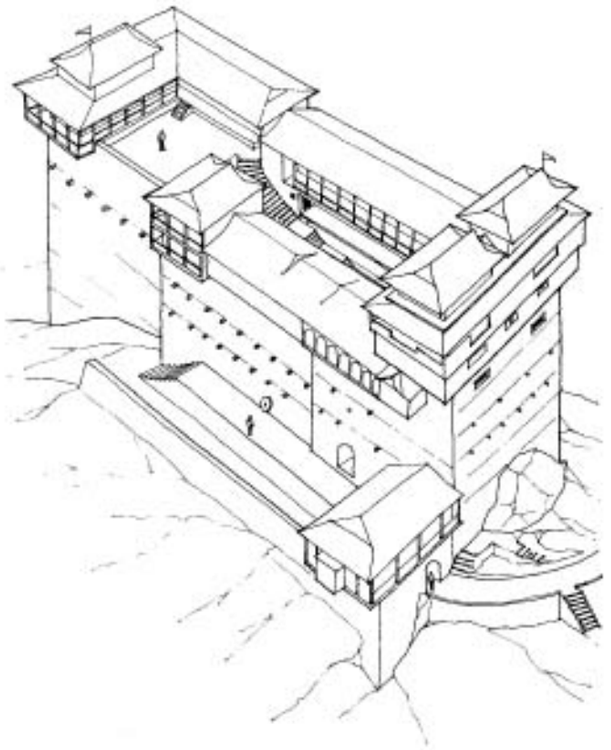
40a 40b 40c 40d 40e 40f



40g 40h 40i 40j



40k 40l 40m



50

Darbargadhs

The powerful historical leaders of the villages (Royal families) built grand houses (figures 50 to 66) that reflected their status in the community. Whereas an ordinary villager would use forty or sixty trees for a house, the King could afford hundreds of trees. The *darbargadhs* were built using the same *kath-khuni* construction techniques but they had much larger spaces to address the needs of the royal family.

Darbargadhs have enclosed groups of stacked cuboids, still following the conventional orientation of facing the valley and the mountain but now including enclosed courtyards or narrow street-like open-to-sky spaces and towering cuboids as temples at the highest point, for significant yet personal local deities (figures 58, 66, 67). The entrance for the people of these princely houses is separate from that of their animals. In these grand houses, people are able to circumnavigate the interior courtyards (figures 57, 62, 65) from the inside. The inhabitants use the balconies like the common villagers; only the *darbargadhs'* balconies are elaborate, enclosed and frequently carved with local flora, fauna and deities. Because such buildings have both secular and sacred

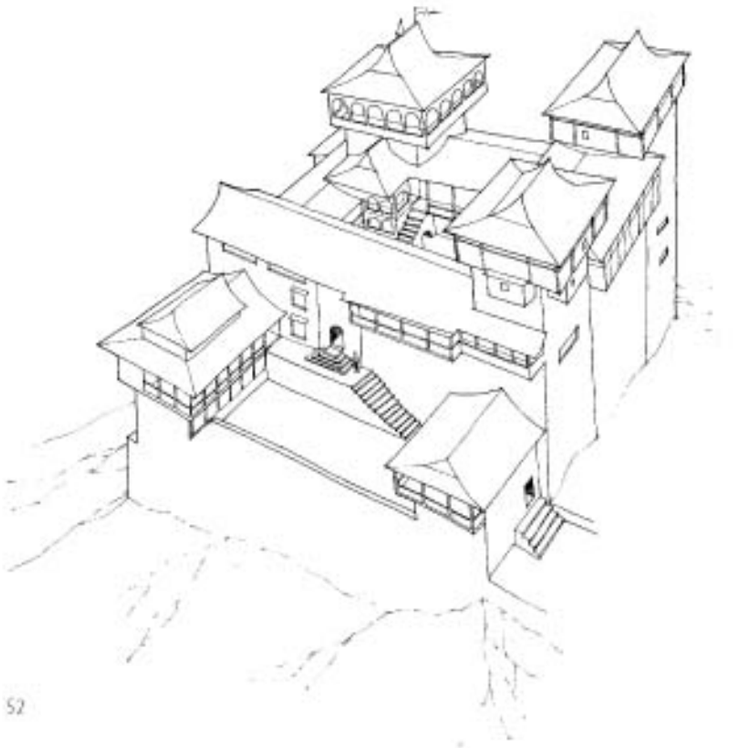
50. *Darbargadh*, Kotkhai Village. This is an aerial view of the palace compound indicating the gable and pent-and-gable roofs. The temple is at the highest point and also acts as a watchtower. The inner street-like courtyard separates the parts of the building for different family, community and religious functions.

51. *Darbargadh*, Kotkhai Village. The *darbargadh* is the tallest and most imposing structures in the village, especially the tall temple attached to one end of the compound. The top floors have balconies. The lower half of the building resembles a fortress rather than a palace. We can see modern construction in a small commercial building of brick, wood and metal nearby. The mountains provide a fitting backdrop to this impressive complex *kath-khuni* structure.

51

spaces, there is more attention to ornamentation, carvings (figures 60, 61, 68, 69) and personal expression. Greater ornamentation represents the ability of the King to commission such work and the greater reach of the King's power because he had the aesthetic knowledge and travel experience to collect and display beautiful artwork. *Darbargadhs* are connected to the Gods through the interior temple.

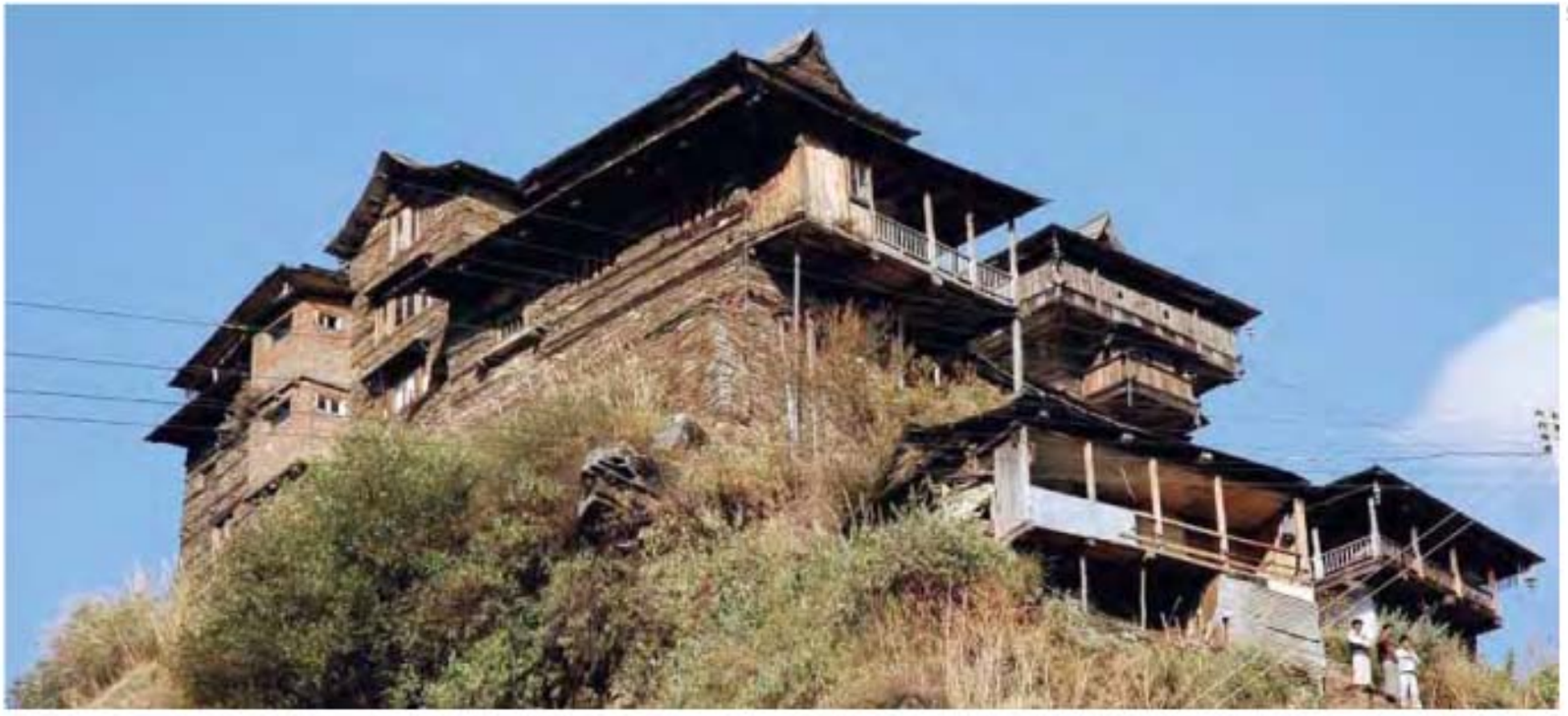
At the same time, *darbargadhs* reinforce aesthetic and technical standards by exploring to the limits the same *kath-khuni* construction that creates the vernacular built forms of the village. The King commands more of the same ecosystem to claim his domain. We made a partial visit to two *darbargadhs*, in Kotkhai and Khaneti. They both contain all the elements of a large scale vernacular house with the added attraction of an interior temple of the clan deity (*kul-devi* or *devata*). Each possess a unique layout (demonstrating the individualism of the owners) and a substantially different treatment of the interior temple. The temple in Kotkhai *darbargadh* has a subdued and sophisticated structure like that in the village for the local deity. While the Khaneti *darbargadh* has a brightly painted temple perched like a gilded structure at the top of the house and at the peak of the mountain.



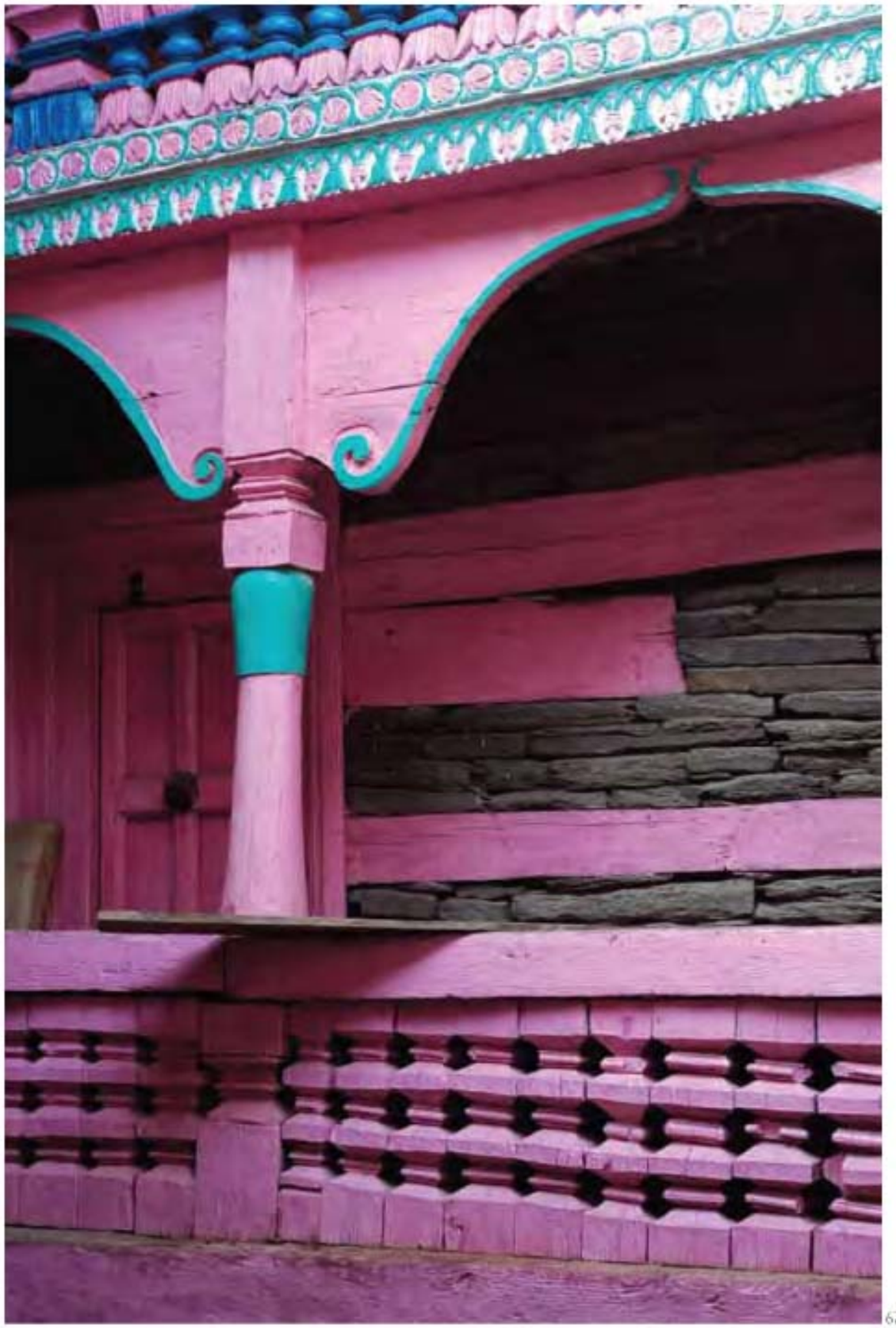
52

52. *Darbargadh*, Khaneti Village. This aerial view shows the *darbargadh* with an internal courtyard and an external courtyard that is an open space. This outer courtyard is used when the King wants to meet the people at his house without permitting them to come into the inner sanctum containing the temple. The scale, configuration and planning all reinforce the social order of the hierarchy in the village.

53. *Darbargadh*, Khaneti Village. A view of a rambling *darbargadh* located at the top of a hill. There is new construction on one side of the building that uses brick, cement, wood and metal. In this palace, there are balconies at several levels. The configuration of the building is a metaphor for the complex social structure required by the King to lead a community.



53



67

67. Detail of painted temple, Khaneti *Darbargadh*. The pink, turquoise and royal blue paint is applied meticulously to highlight the surface carvings of the wood. The stone is left bare.

68 (a, b). Detail of friezes, outer courtyard wall, Khaneti *Darbargadh*. Both these elegant friezes have intertwined cone and flower motifs – one of the common ornamentations observed in the facades of the vernacular built forms of Himachal Pradesh. The top frieze (a) is crowned with a repetition of flowers with four petals.

69. Wooden house guardian, Khaneti *Darbargadh*. Armed with a bright red bow and arrow, a warrior, symbolically fighting off the evil spirits, guards the main door to the *darbargadh*. The use of stark contrast in colour with a white figure in a green background makes this simple carving stand out like a beacon on the neutral surface of the wall above the door.

68a

68b

69

70a

70b

70c

70 (a to e). Documenting woodcarvers working on a temple restoration, Sarahan Town. Two students talk with the lead carver (a) and his apprentices about their craft practice. The two carvers discuss about part of the door frame (b), while a woman uses sandpaper to give finishing touches to another carved piece of wood (c). The master carver demonstrates the process of wood carving with a rounded chisel on a carefully drawn floral motif (d). He shows in detail how the curved chisel allows him to carve rounded surfaces accurately (e). Photographs: Tarang Sagara

71. Carved and painted wooden door in a *kath-khuni* house, Jhaknoti Village. Here, the carving is layered in the construction of the door frames. Contrasting bright colours emphasize the motifs (natural and figural) and patterns of the carving. The overall effect is eye catching and inviting.

70d

70e

71

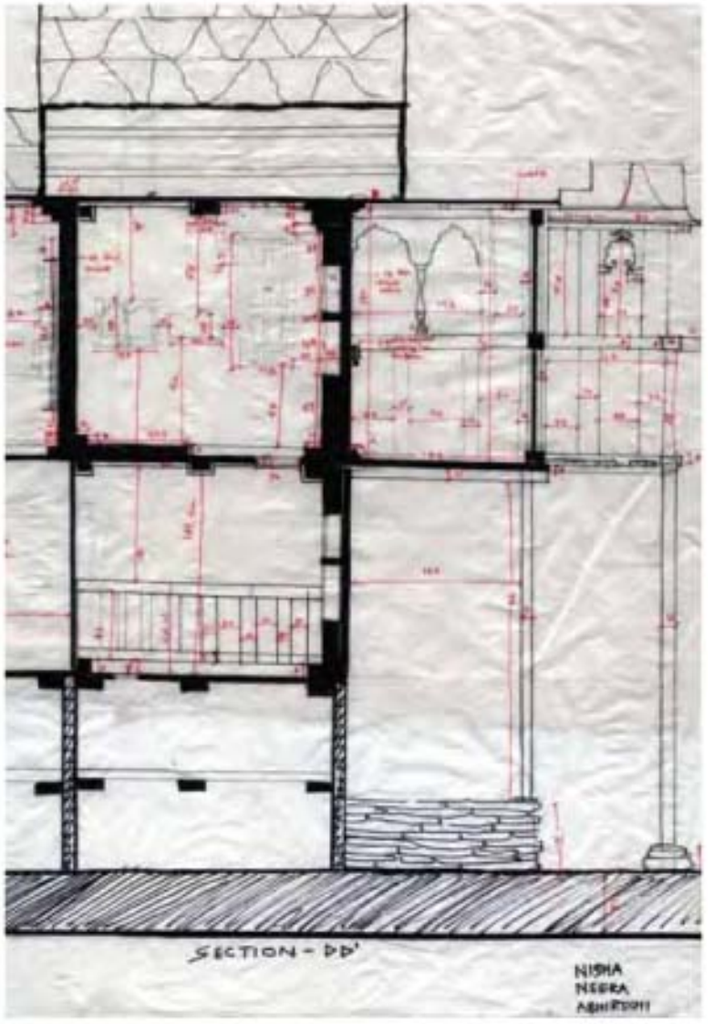
Woodcarving integrated in the *kath-khuni* built forms

Woodcarving, as ornamentation of the *kath-khuni* built forms, is one of the oldest crafts of Himachal Pradesh. Ornamentation of large *wood-and-stone* built forms is an artistic testament to the sustainable natural resource of the great deodar cedar tree and the people's ability to create visual narratives. Woodcarving is a form of folk art that enables the local people to express their culture – whether the motifs are abstractions based on nature, spiritual awareness, or the replication of patterns found in local flora and fauna. Towards the end of our 2006 trip in the town of Sarahan, we had an enlightening encounter with traditional Himachal Pradesh woodcarvers working on the restoration of the Bhimkali Temple (figures 70, 226). We interacted with the craftsmen while they worked and came to understand the four stages of their process. We received permission to photograph the work in progress. There is a clearly defined repertoire of motifs and patterns in Himachal Pradesh surface woodcarving that, with personal variation, appears to be from the same artistic community.

The ornamental images are repeated in all Himachal Pradesh vernacular built forms with greater or lesser intensity. Temples receive the most attention followed by *darbargadhs*, large houses, and finally granaries. This is in direct proportion to the size of the structure and the resources available to employ master craftsmen. Woodcarving is integrated into the construction of the building, and not added later (figure 71). The exception to this is freestanding wood sculptures of temple deities and masks carved for festivals or rituals. Three-dimensional carving is most often found in temples and *darbargadhs*. Sculptural carving appears on columns, studs, door-frames and hanging pendants. In local temples and house-shrines, there are sculptural wooden deities either in the sanctum or in prayer niches. We saw only a few examples of old sculptural woodcarving. The woodcarving, that we observed, was two-dimensional (planar surface-based). In our examples, a prepared piece of wood has only a single outer surface ornamented.

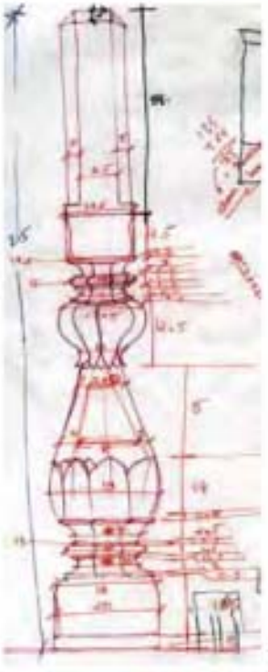
The process of carving has four phases and utilizes tools fabricated by the local blacksmith (figure 72). The basic woodcarving tools include the *aari* (handsaw), *basola* (adze), *randa* (plane), *nehan* (chisel) and *hathodi* (hammer). The first phase of production is preparation of the wooden log, when the craftsmen measures and cuts the wood to the desired size with the help of carpentry tools. When the satisfactory size and surface is achieved, the master craftsman moves into the second phase of production. He draws the pattern on the wood with a pencil or pen. Less elaborate and repetitive designs are achieved with the use of stencils. This is the critical part of the process because it is when the master craftsman creates the story in images on wood. The ornamentation is a mixture of classical forms, popular local motifs, repetitions of previous work and new variations within the parameters of local aesthetics. The degree of creative expression varies depending on whether it is to be used in religious, communal or secular built forms. Expression also depends on the skill and knowledge of the craftsman and the quality of his tools. Rules are much more stringent and defined for woodcarving on temples.

72 (a to j). Handmade woodworking tools, Sarahan Town. This is an essential tool kit of a traditional woodcarver that includes *nehan* (chisel) (a to g), *hathodi* (hammer) (h), punch tool (i) and *basola* (adze) (j). The metal part is fabricated by a local blacksmith and the wooden handles are added by the woodcarver. Photographs: Tarang Sagara

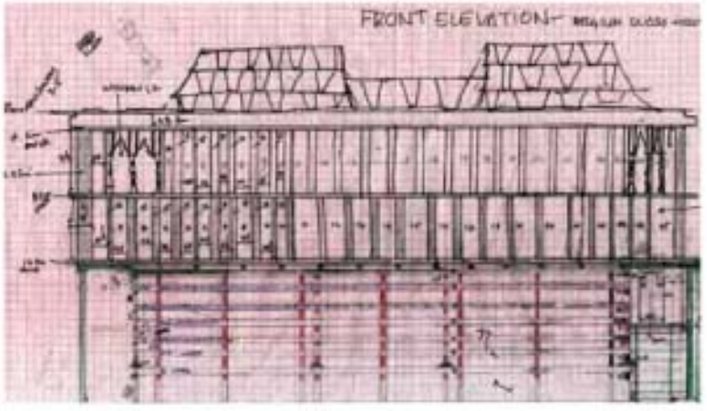


74a

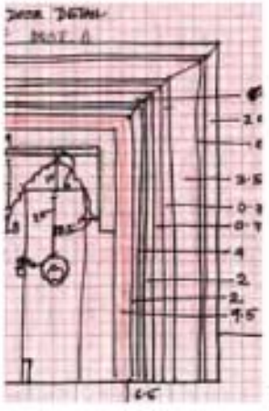
74c



74d



74b



74e

75a

75b

75c

75d

75e

75f

Measure drawings of the *kath-khuni* houses

'Living with Craft' (Related Study Program) – a measure drawing project began with an on-site inspection by the SID faculty members along with local guides. When our SID team arrived in the Sutlej valley of Himachal Pradesh we had decided on several criteria for selection for the built forms to be measure drawn. These were:

1. **Age of the built form**; this suggests the continuity of built form through time and space.
2. **Scale of the built form**; this expresses the social and economic status of the owners and their subsequent ability to build a certain size of house. We were looking for a comparative sampling and so we chose four buildings of different sizes to measure draw. We assigned different numbers of students depending on the size of the building.
3. **Function of the built form**; we were primarily interested in houses (secular) but recognized that granaries (communal) and temples (religious) were constructed in a similar technique (*kath-khuni)* and should be included.
4. **Permission of the owners**; it was important to build a rapport with the owners of the property in order to make respectful use of their space and to leave a positive impression of our work.

Specific sites were assigned to the students. Each student had graph papers, a sketchbook, a tape measure and pencils and some had cameras. The team was divided into small groups to make basic plans, elevations, and sections of the built forms. Details were inserted as the measure drawing proceeded. Two-dimensional drawings were completed on site in approximate metric scales of 1:50 for overall drawings and 1:20 for details. Any further details like joinery, hardware or carvings were represented in 1:1 scale. The exterior of the built form was measure drawn determining the overall building footprint and, wherever appropriate, the surrounding exterior spaces were also included. Interior spaces and their elements were integrated in these hand drawings.

Social use of spaces was documented with sketches, notes and photographs. Materials and finishes of the built form were drawn, sketched and photographed. Details of craft elements and aesthetic ornamentation were measure drawn when they indicated a distinctive feature of the local environment. This is two-dimensional technical hand drawing and observation process. When the students returned from the field they were required to convert their two-dimensional working drawings into finished technical renderings. This process involved synthesizing the field drawings done in various parts with observed information and photographs to realize the most accurate rendition of the studied built form.

From their plans, elevations and sections, the students came to realize a three dimensional space from two-dimensional drawings in their minds. They learned to collaborate with their team members in order to gather the maximum information to complete the drawings. When the whole group viewed their results they could perceive the patterns and forms of the place through their own drawings.

The measure drawings and research from the 2006 Himachal Pradesh 'Living with Craft' study trip have been compiled in an ascending order based on the size and scale of the house. In order to make a further comparative analysis of the important information gathered by the students, the *Mātrā* Team at SID Research Cell digitized their findings. Interviews with participating students of the study trip provided personal insights into interior spaces and social experiences.

74 (a to e). Field-drawings, Himachal Pradesh. These are the original drawings done on site by second year SID students. The basic information is rendered in black marker and the details are added in red. The process starts with plans, sections (a) and elevations (b). This is followed by drawings of different details including niches (c), columns (d), doorways (e) and other important elements.

75 (a to f). The process of Measure Drawing, Himachal Pradesh. Students sit on the stone plinth (a, b) and make detailed studies of houses and granaries while soaking in the mid-day sun. A student (c) refines a graph paper rendering of the plan of the house. Three students climb up from the ground to the balcony of a granary (d) and measure draw. The first person is measuring, the second is noting down the information and the third is checking for errors. According to the task assigned, different groups (e) of students co-ordinate the measure drawing process, working as a team. A group of students (f) discusses what other types of documentation (sketches and photographs) are required to complete the information. Photographs: SID students.

Shri. P. C. Aukta House, Old Jubbal

Shri. P. C. Aukta House in Old Jubbal is the largest residential vernacular built form we measure drew in our field-trip to Himachal Pradesh (figure 94). Because of its size, there were many innovative uses of interior space in this house including split-level storage rooms, in-built granary and entertainment spaces (figure 192). The formation of the house is accomplished with the same basic sets of cuboids but this time they are three cuboids stacked three times side-by-side to form a house composed of nine cuboids. As per the local norms, the long walls are parallel to the mountain and the *gaushala* doors faces the valley. The entrance of the living quarters is parallel to the *gaushala* door and is approached by a wooden staircase at the side of the house leading to the enclosed first floor balcony through the entrance door.

The organization of the functions for each level of the house is the same as the other houses we measure drew. The *gaushala* is larger and has more cows (figure 96). The house is built on a high stone plinth. This allows the cows to remain cool on the shaded stone plinth in summer and be protected from the cold inside the *gaushala* in the winter. The plinth also protects the main structure from accumulated snow during the winter (figures 97, 98). The first floor has rooms for fixed storage and a unique feature of a mini-granary integrated in the centre of the structure between the first and second floors (figure 205). This is entirely hidden from the outside view of the house and is one of the 'secrets' of this type of construction. It is possible that the *darbargadhs* used such rooms to store food and precious items. The space organization of this private granary is much like the separate communal granary buildings of the village (see Part 3 on page 205).

94

Like the other houses, access from the *gaushala* to the storage floor and to the second floor is through a series of interior ladders and trap doors (figure 101d).

The second floor is used for cooking, living, sleeping, and entertaining guests (figures 99, 100). In the centre of the second floor, there is a room dedicated to the entertainment of guests. This space is open from one side (facing the balcony) featuring carved columns (figure 101a), a colonial style cabinet and a pair of mirrors 'brought from Belgium' and installed in a place of honour (figure 100b). We never found out how the mirrors made it all the way to this remote village from the middle of Europe, but clearly the owners were proud of their international connections. These mirrors and a special room for visitors and guests, all add to the status of the owners of this house. To one side of the entertainment room there is a kitchen (figure 100a), and on the other side there is a living room (figure 100d). A peculiar feature of the kitchen is the corner mud *chulha* built in a rectangular format on a raised mud platform. The walls immediately around the *chulha* (figure 101f) are covered in mud plaster up to the ceiling, where a large vent connects to the roof and a half attic. There are a variety of open, closed and concealed storage units within the walls (figures 101g, 101h). Along with the traditional type of the wall storage, we also observe the colonial style cupboards with spindles and decorative doors. The other part of the walls in the room have horizontal cladding of wooden planks, covering the *kath-khuni* structure of the house (figure 102a).

All of the upstairs rooms and the enclosed balconies are made of beautifully crafted local wood. Both of the balconies have openings highlighted with baluster or turned-wood columns (figure 102b) and cusped arches. The balcony on the second floor has a corner in-built wooden bench to entertain guests as well as to be used for day-to-day social interaction. This balcony also has extended cubical spaces for 'washrooms', which are supported by vertical posts resting on the plinth.

The roof is pent-and-gable and is similar to the Happi Singh House in Kiari village which we measure drew. The Happi Singh House had a pent roof over the 'washroom', while in this house, there is a gable roof over the washroom area. This house exhibits excellent quality of construction. The stones used in the structural walls are dressed stone (chiselled very finely to make cubes with 90-degree corners). This work would take skilled stonemasons just like the ones used to make temples.

The wooden members in this house, whether they are structural or ornamental are of superior quality. The wood is carefully cut and finished. One of the interesting features of this house is the construction of the structural wall. In the lower part of the *gaushala* wall, only stone is used at the base level. In the upper half of the *gaushala* wall, the *kath-khuni* method of layering wood and stone begins. In the first floor, we observe the reduction of height of the stone layer and increment of the same in the wooden layer. This is what we can observe from outside. But when we studied the interiors of the rooms, we found that the walls are constructed with stacking of wooden frames upon each other on the interior side. While on the second floor, the stacking of only wooden frame with an infill of rubble is seen from the outside as well as from inside the house (figure 161).

We encountered and documented woodcarving at selected places in this house including the staircase, internal storage units, door lintels, balcony columns and living spaces. We documented many unusual wooden joints employed in the structure (figures 102c to 102e). This house demonstrates the craftsman's specialized knowledge of stone and wood and the ability of the house owner to employ their skills to make an outstanding example of local *kath-khuni* built form.

---

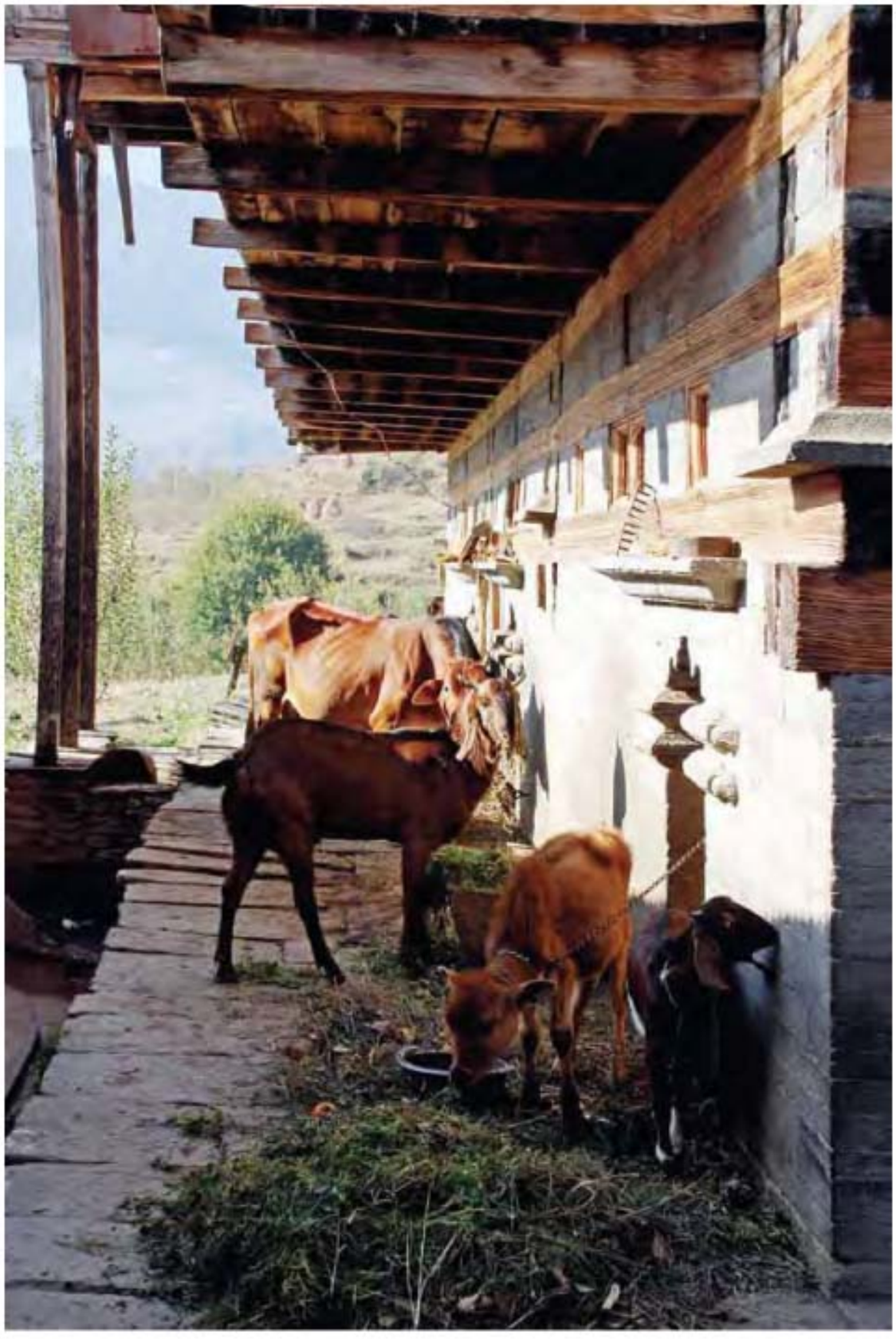
94. Aukta House, Old Jubbal Village. The Aukta House is oriented in the traditional manner with the front (long side) facing the valley and the back facing the steep mountain. The two enclosed circumnavigating balconies have a series of openings with cusped arches and turned-wood balustrade columns. Photograph: Rajesh Sagata

95 (a, b). Shri. P. C. Aukta and his wife, Old Jubbal Village. The husband and wife who own the Aukta House were very open to our visit. Their *kath-khuni* house was in partial use. Only the *gaushala* was actively occupied by cows and goats. The upper floors had furnishings but were not being used, which made the task of measure drawing easier. Photographs: Bhumika Gajjar

95a

95b

96



97

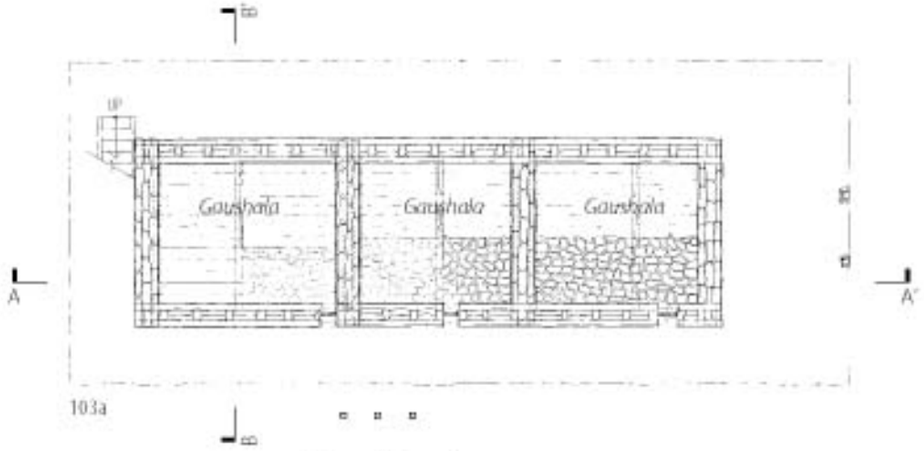
98a

98b

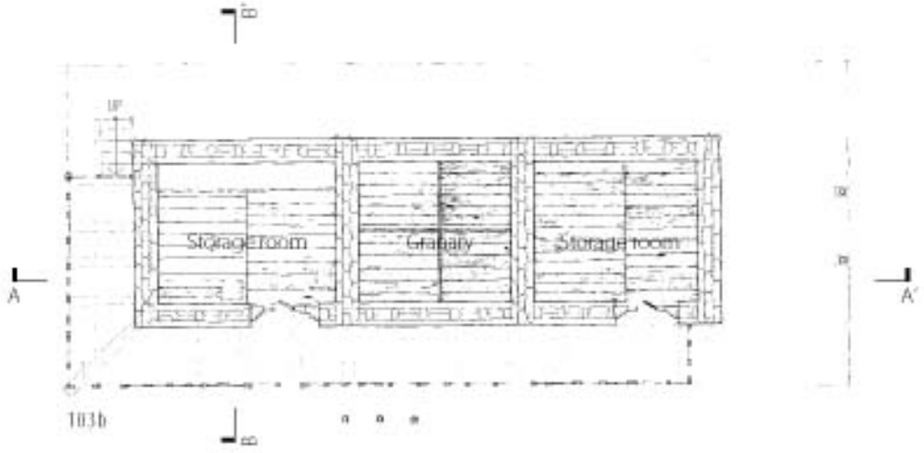
96. The Aukta cows and goats, Old Jubbal Village. The cattle feeds on fodder outside the *goushala* on the sun-drenched plinth. The structural wall here has a well finished stone slabs compared to other houses. (Refer figure 166 for structural wall detail). Photograph: Rajesh Sagara

97. Lower floor staircase, Aukta House, Old Jubbal Village. A set of wooden staircase with a railing connects the plinth to the first floor. The structural planks on the sides of the staircase are carved with abstract floral motifs. (Refer figure 169 for details).

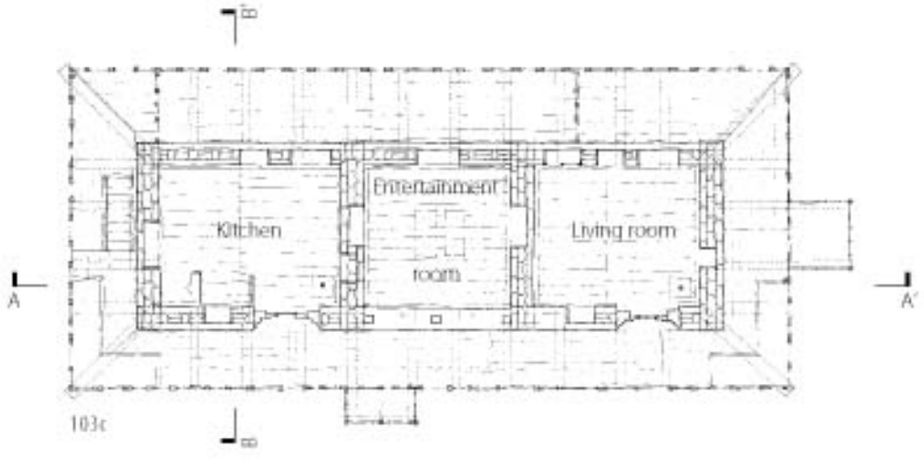
98 (a, b). Details of external structural walls, Aukta House, Old Jubbal Village. The structuring of the *kath-khuni* construction is clearly visible in these two corners of the house. The enclosed balcony is cantilevered. Photographs: Bhumika Gajjar and Jay Thakkar



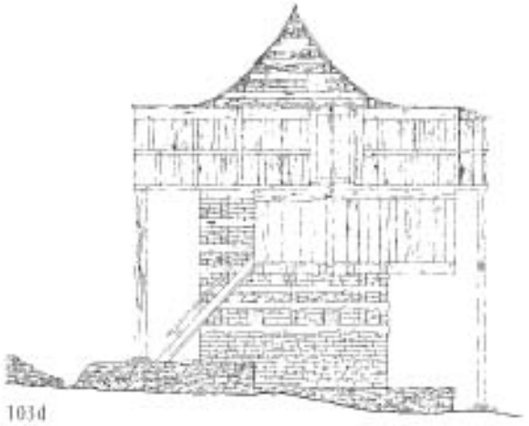
Ground floor plan



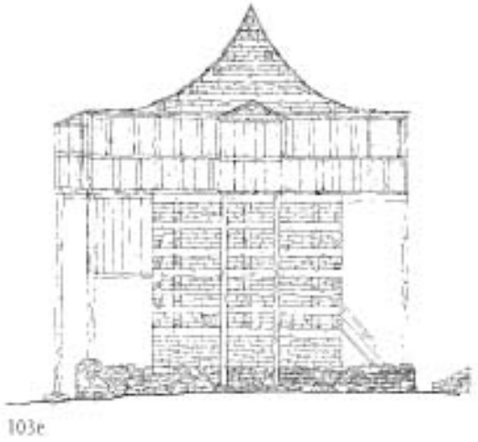
First floor plan



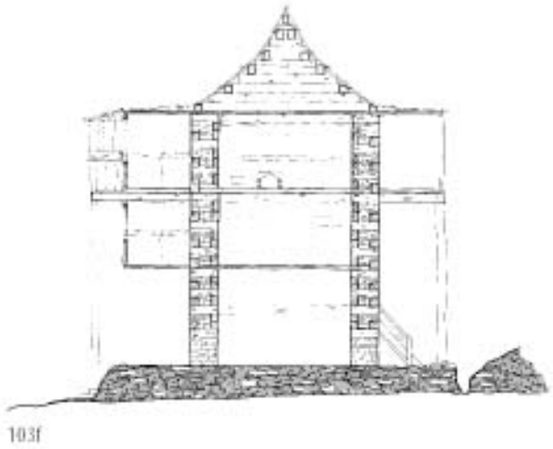
Second floor plan



East elevation



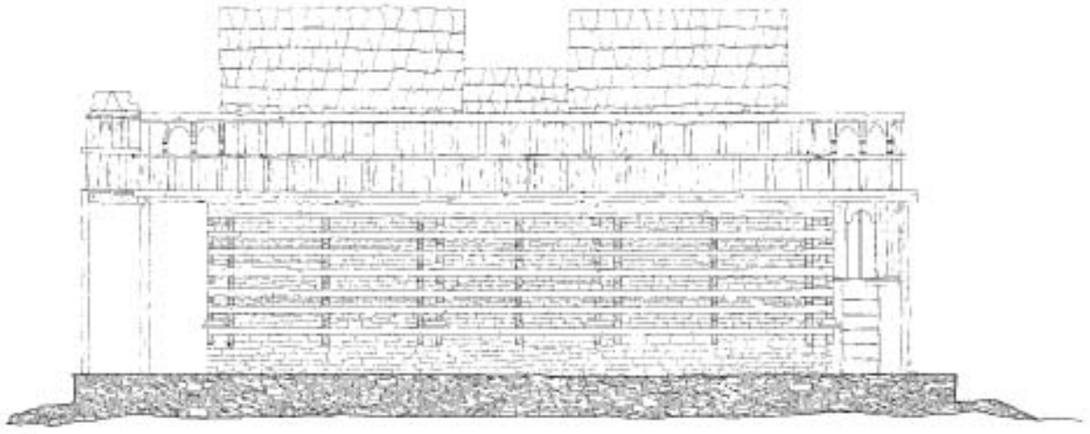
West elevation



Section AA'

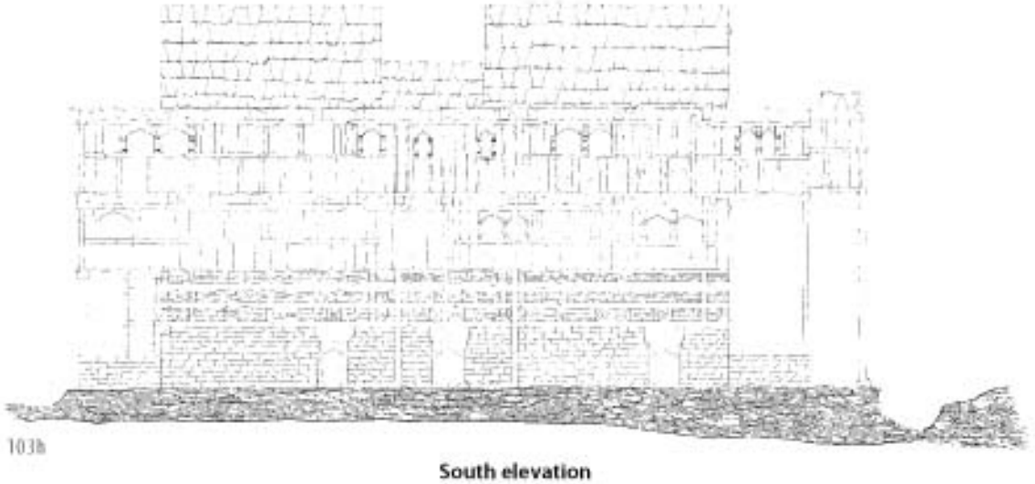
N

103 (a to i). Measure Drawings, Aukta House, Old Jubbal Village. Plans, elevations and sections starting at the lower level and ending at the roof structure. This house is used as a case study for in-depth analysis. Refer the Portfolio and analysis of Aukta house on page 121 for details. Students' team for these measure drawings – Smita Agrawal, Abhiruchi Bardava, Nishar Dantrelia, Bhumika Gajjar, Hinal Muzumdar, Jagrut Raval, Puloma Robin, Neera Soni.



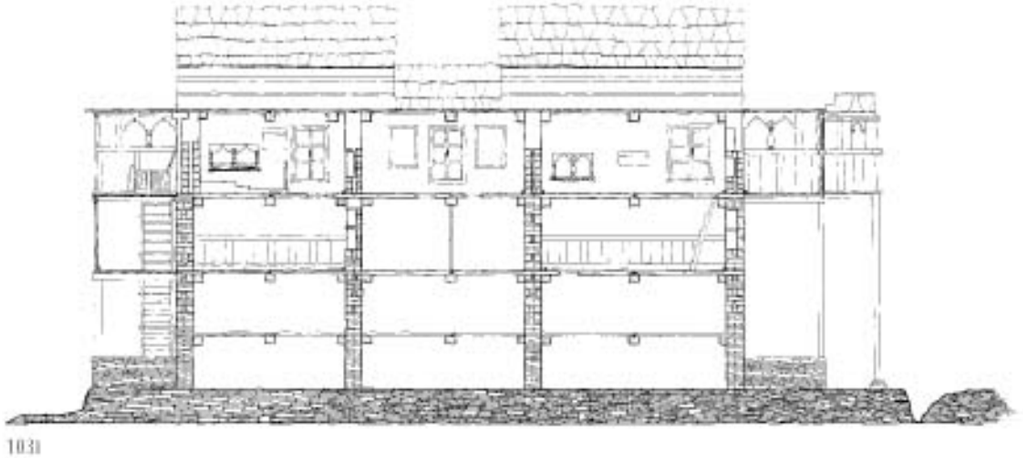
103g

North elevation



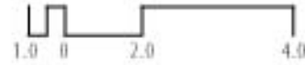
103h

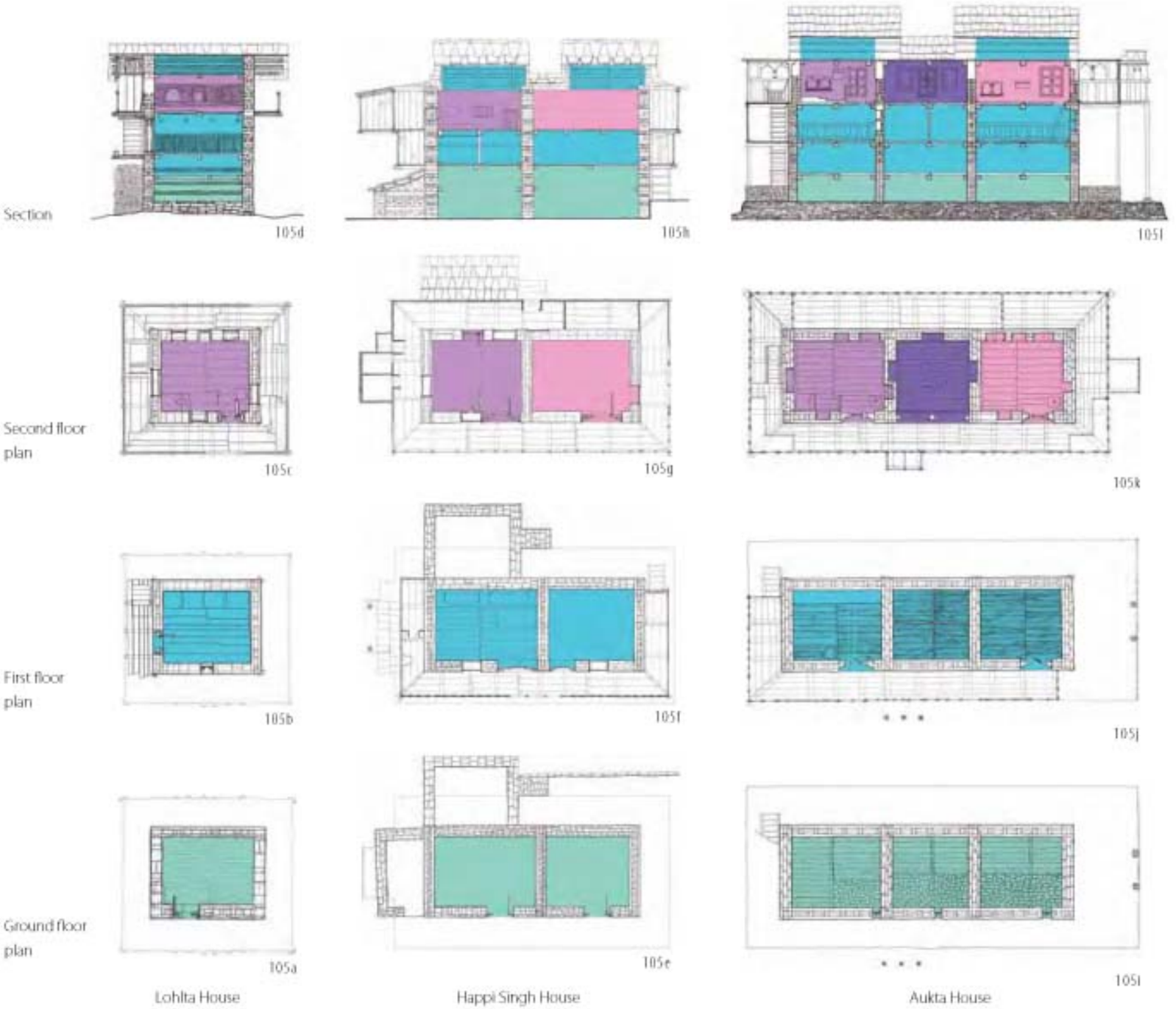
South elevation



103i

Section BB'





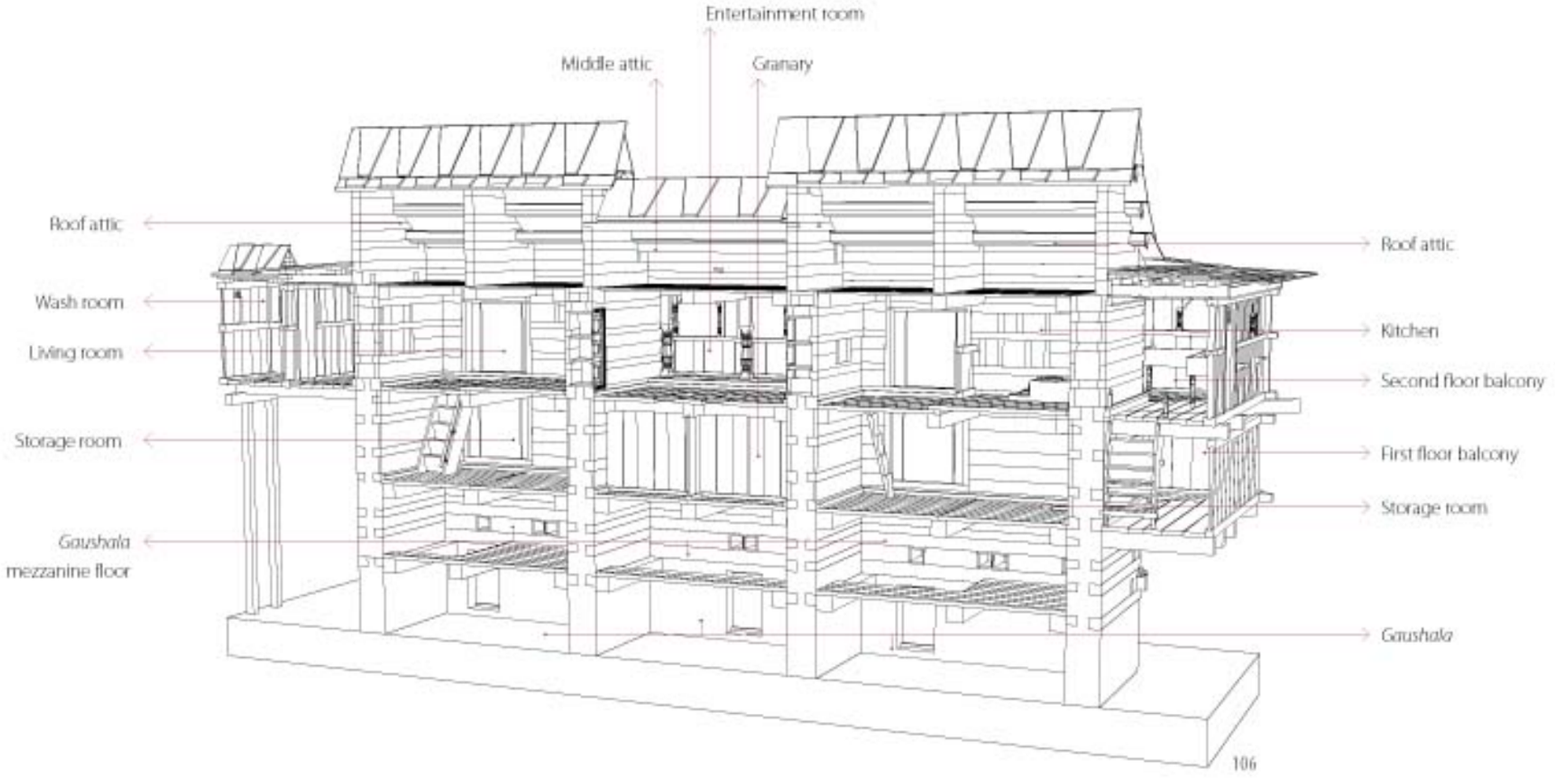
105 (a to l). Indication of functions through colour-coded plans and sections. The colour coding indicates functions and organization of spaces according to the levels of each floor. Three houses (measure drawn by SID team) of different scales are chosen to indicate the similarity in the space organization.

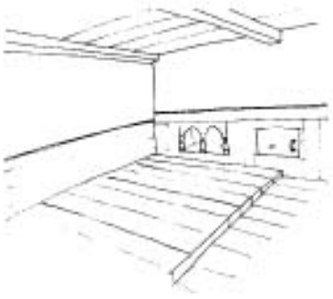
106. Digital sectional perspective, Aukta House. A longitudinal section of the house shows the organization of spaces and their function and the relation between different functions on each floor.

Living at home

Social use of spaces

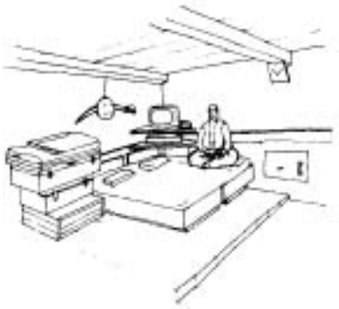
People who share a common location, beliefs and activities express their values through the way they live. This is true about the villagers of Sutlej valley region in Himachal Pradesh. In each level of their houses and in each season of the year, spaces are used in a pattern that makes the village a cohesive unit (figures 104 to 106). Climate plays an important role in defining the use of space within as well as outside the house (figure 108). In the warm sunny days, the activities take place outside the house on balconies and plinths, while during the colder times, during winter and night, the daily activities are performed within the warmth of the *wood-and-stone* walls. We studied the interior spaces of the house in terms of social patterns in order to understand why it was constructed and used in a particular manner. We examined in detail the salient features of the house, the *chulha* (or hearth), the personal storage systems and transitional spaces in order to understand how each house reflects the personalities of the inhabitants while at the same time represents the members of a coherent community.





120a

120b

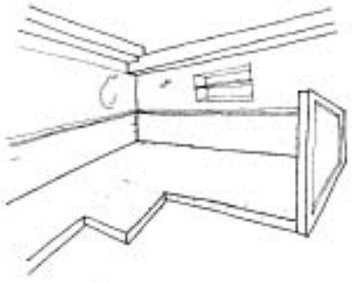


120c

120d

120e

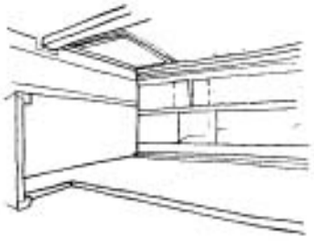
120f



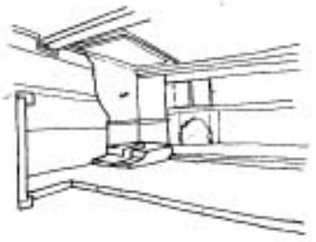
120g

120h

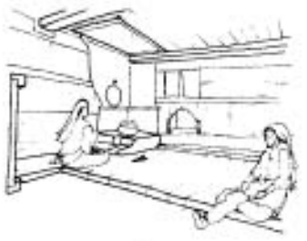
120i



120j



120k



120l

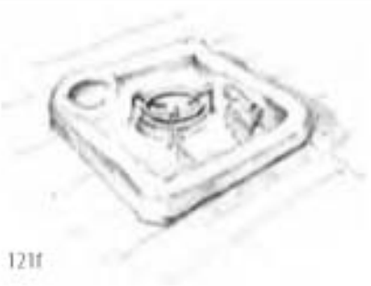
121a

121b

121c

121d

121e



121f

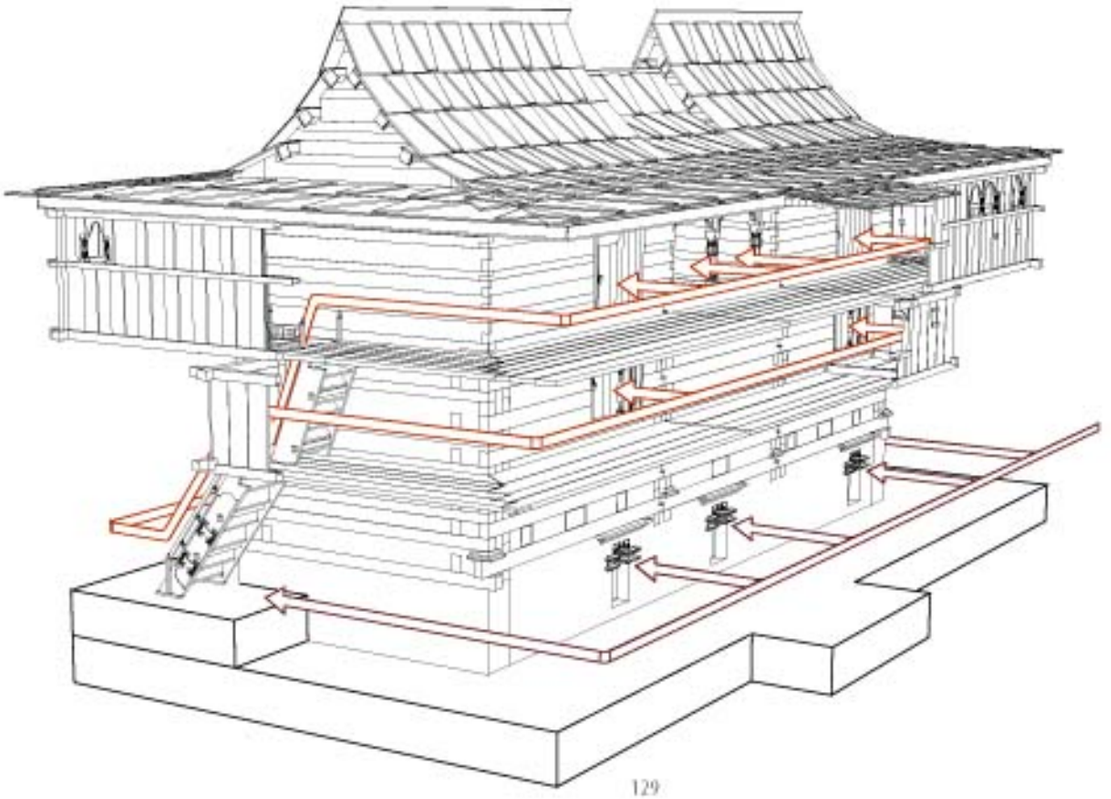
120 (a to l). Progressive analysis of interior spaces. The first and second floor rooms of *kath-khuni* houses. Each room has three progressive vignettes; the first is empty, the second is furnished and the third has people and small objects animating the space. The illustration shows one room for sleeping (a to c) and three rooms as kitchens (d to l). It shows the open-endedness of the spaces and their organization. The basic structure remains similar but the interior organization in terms of the placement of *chulha* and storage elements caters to the need of the owner. Illustrations: Manika Chawra

121 (a to f). Types of *chulhas*. Women of the house fashion their own *chulha* out of mud depending on the size of their families, the size of the pots and the cooking style. These *chulhas* are the defining aesthetic and practical elements of the kitchens. They provide light, warmth, nourishment and an opportunity for women to express individuality. We also observed the use of electric and gas stoves in conjunction with traditional *chulhas*.

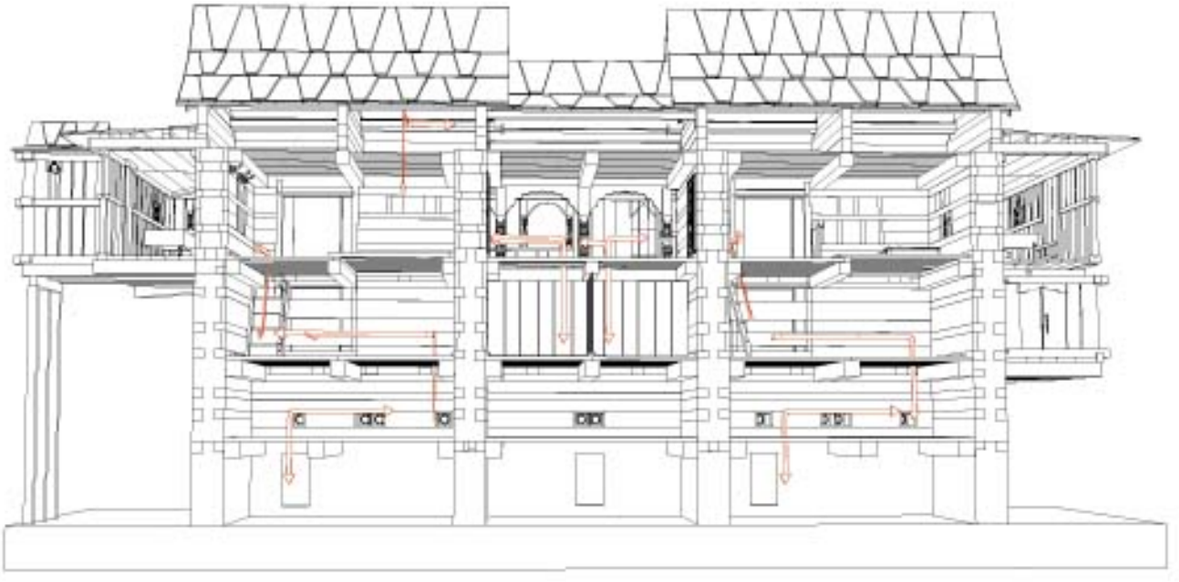
122 (a, b). Corner and central kitchen *chulha*, Himachal Pradesh. The *chulhas* are usually placed in the corner (a) of the kitchen in the *kath-khuni* houses. This system allows the smoke to escape through the openings made in the roof. Another placement of the *chulha* can be in the centre (b) of the kitchen. This central organization allows the family to sit and socialize around the *chulha* basking in its heat in the winter season. Since cooking is the prime activity for the rural women of Himachal Pradesh, innovations with stoves and the usage of utensils are important forms of artistic expression for them.

122a

122b



129



130

129. Digital illustration of different access paths, Aukta House. The majority of houses observed by the SID team are oriented with their longest side facing the valley and their back towards the mountain. In the houses measure drawn, the *gaushala* entrance faces the south while the entry to the living areas is from the north. The *gaushala* is accessed from outside at the plinth level while the living and storage spaces at the upper level are through the balcony that is approached by an external staircase facing the mountain side. The ways of entering and exiting the house from the outside expresses the coherent spatial organization.

130. Digital illustration of internal movements, Aukta House. This illustration of this *kath-khuni* house shows the movement path of people within the house through the trap doors and internal stairs and wooden ladders. The vertical internal connections of the different spaces reinforce the notion that the entire building is an integrated built form.

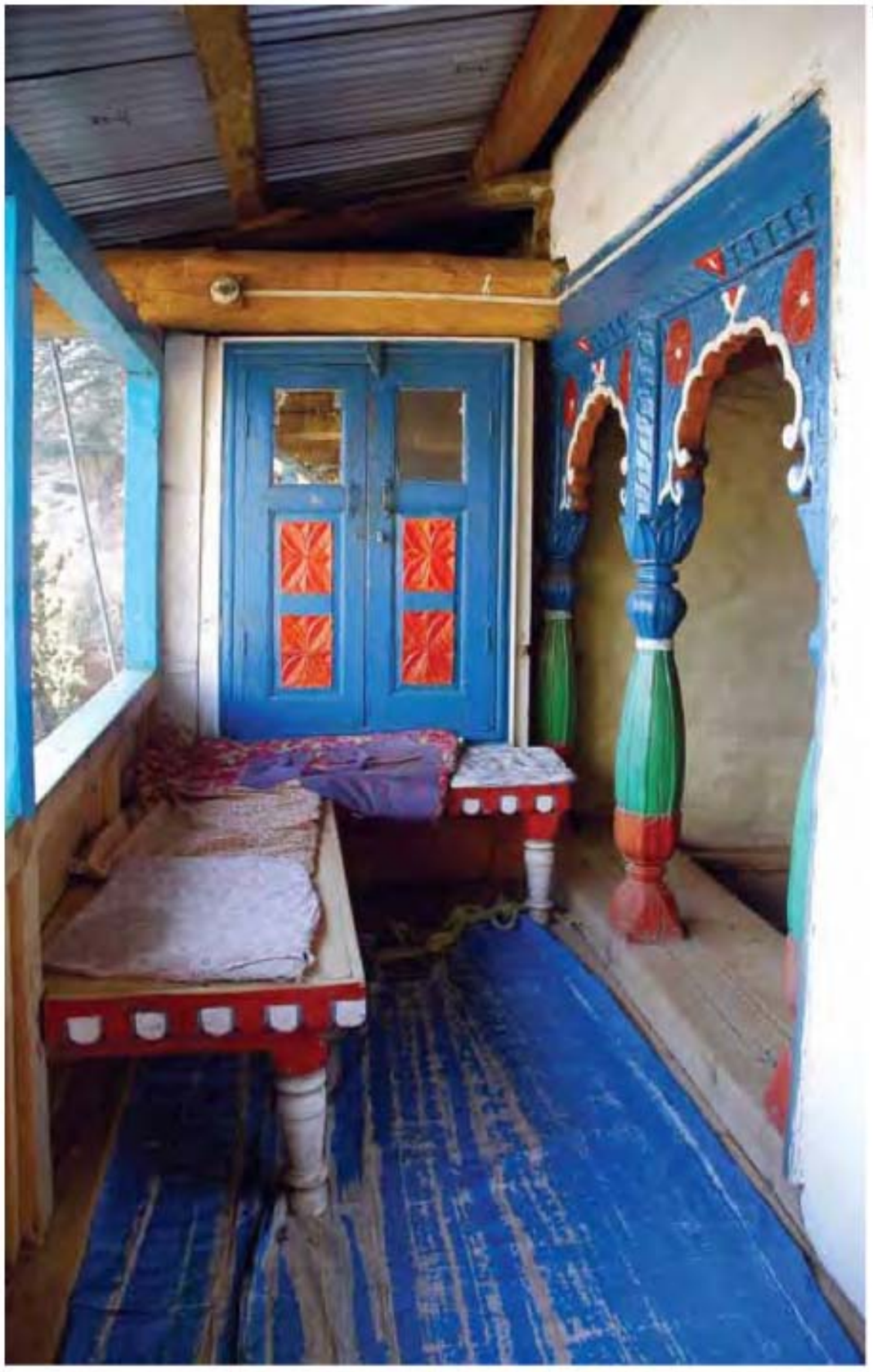
Transitional spaces

Transitional spaces in vernacular houses of Himachal Pradesh are the connecting links between interior personal rooms and the shared public places outside (figures 129, 130). These spaces include the plinth at the ground floor, balconies at the upper floors and vertical connections like stairs and steps. They act as the extended threshold of a house. All the houses, we observed and measure drew, have transitional spaces. They followed an organisational pattern parallel to the basic house form. These narrow linear spaces have variation in scale, articulation, type and functions creating a vocabulary for the unique identity of each built form.

Starting at the ground floor, the 'plinth' is the first transitional space we encountered. It is made of slabs of slate stone layered over the entire footprint of the house and extending out from the structure to beyond the overhang of the roof. This plinth extension is usually on the front (longer) and two (narrower) sides of the house. The back of the house has its' side towards the mountain and so a stone layering is frequently built to prevent the sliding of rock and rubble onto the house. The plinth is the transitional space for receiving the needs of the house, from food and fodder for animals to the necessities of the people inside. It is also a social space where neighbours meet to share information and strangers come to ask for assistance (figure 131). The 'plinth' demarcates the house from the street and the nearby buildings.

Built entirely of wood, the balconies are the most diverse and integral transitional spaces in *kath-khuni* houses. They are found on the first and second floors of the house. Balconies vary in terms of their types and scale (figure 132). The balcony is built around the perimeter of the building either on only one side of the house or in a 'L' or 'C' shape. Some balconies at the uppermost floor even circumnavigate the entire house (figure 46). Balconies act as an intermediate space between the interior rooms and the outside spaces. The balcony space is either open from the side, or has a wooden parapet with openings, or is completely closed with intentional openings in the corners and along the sides of the wall panels (figures 41 to 44). These spaces act as a second skin to the house. These wooden balconies help in maintaining the conducive temperature within the interior spaces. Most vernacular houses have a semi-covered or open balcony on the first floor. These spaces are used to transport people and goods to all spaces of the house. We saw open first floor balconies used as laundry lines, sorting centres for agricultural produce and as social spaces during the sunny part of the day. These balconies acted like 'sun-rooms' allowing people to sit and bask in the heat from the sun on cold winter days while conversing with their family and neighbours at other levels of the village. They were also spaces for

131 (a to c). People on the plinth and outer courtyard. These exterior spaces are coherently linked to the houses. They are transformed into 'open rooms' for completion of domestic tasks during the warm daylight hours. The tasks include informal socializing (a), preparation of food for storage (b) and doing the laundry (c).



133

134a

134b

134c

134d

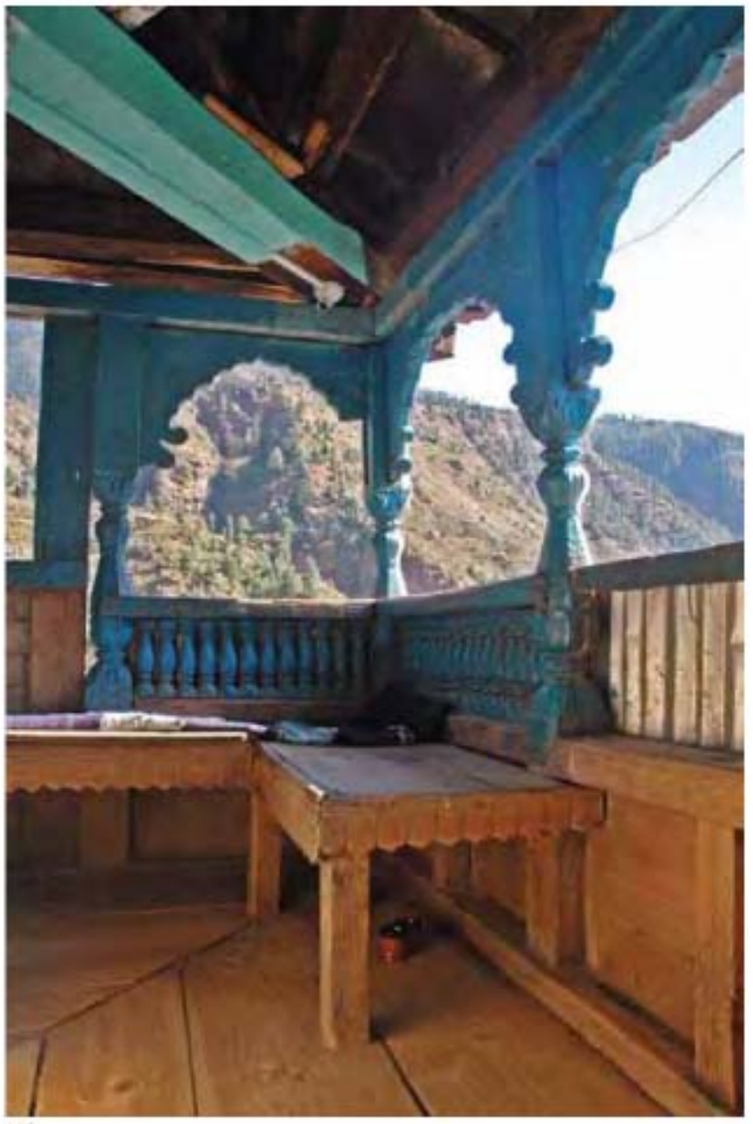
Sorting, washing, chopping and preparing all types of food begin on the balcony and are then moved into the kitchen. We saw corn, rice, vegetables and fruits being sorted and cleaned on balconies either for immediate use or for storage (figure 134). In the balconies, with in-built furniture (figures 135, 136), we witnessed community meetings, casual discussions and students doing their fieldwork catching the last rays of the sun. It is only after dark, when the cold sets in, that people move inside and away from these lively parts of their houses. After dark, the only balcony spaces, which are used are the 'add-ons.' These are bathrooms and wash areas (figures 137, 138). They are enclosed cube forms added to the existing rectangular volume of the balcony. In order to support these latter additions, vertical posts are employed to support the washroom. When necessary these spaces permit the people in the house to complete tasks without leaving the house.

133. A colourful balcony, Jhaknoti Village. Like a modern painting, the balcony is coloured as if a painter wanting to make a stage set. It is a beautiful example of the integration of craft practices with the vernacular built forms.

134 (a to d). Different uses of balconies. A local spinning yarn (a), washing and sorting the laundry (b), preparing the food (c) and relaxing on a wooden bench (d) – some of the activities performed in the upper balcony. The versatile balcony connects the light and warmth of the day with the needs of the residents.

135. A seat in the corner of the upper balcony, Dhagoli Village. The in-built wooden bench is an important interior element in the balcony. It provides stability to the corner junction and is instrumental for socializing with family and entertaining guests.

136 (a, b). Spaces for a rendezvous, Jhaknoti and Dhagoli Village. SID faculty members, Nehal Bhatt and Rajesh Sagara, are being served *chai* (tea) and delicious food by the house owner (a). The rural people of Himachal Pradesh are very hospitable and treat visitors as Gods. A group of neighbours and family members (b) socialize sitting on the in-built bench in the corner of the first floor balcony. Here, they can catch up on the day's news and at the same time observe the village activities.



135

136a

136b

140

140. Watercolour illustration of Shri. P. C. Aukta House, Old Jubbal Village, Shimla District. A first year SID student, not part of the SID study tour, painted a watercolour illustration in Ahmedabad based on the photographs and drawings from Himachal Pradesh. Illustration: Vaidehi Parikh

Portfolio and analysis of Aukta House

After two field trips to Himachal Pradesh, the faculty members and students of SID compiled a set of their documentary materials. These were hand-drawn measure drawings, sketches and photographs. The members of the *Mātrā* Team at SID Research Cell began the process of formal analysis of this data. We began with discussions about the types of drawings that could be generated from the students' work and transformed to provide new ways of looking at vernacular built forms. We decided to concentrate our efforts on one house, largest and the most spectacular, Shri. P. C. Aukta House in Old Jubbal village. The measure drawings that appear earlier in this chapter were all digitized. The digital designers of the *Mātrā* Team set to work - drawing, assessing and revising their ideas.

The Portfolio and analysis that follows is the result of many months of activity. It represents the sequence of the thought patterns and discussions of members of the *Mātrā* Team. The learning process includes stretching the technical limits of our imagination through computer programs used by Interior Designers and Architects. Our digital tools were AutoCAD and 3Ds Max computer software. Through our analytical and technical capabilities, we created a holistic view of a built form; in this case a vernacular house in a mountain village. The makers of the Aukta House are the local people. They do not keep written or visual records of their designs except from the previous existing vernacular built forms and through an oral tradition of sharing information from generation to generation. For designers, architects, students and people dealing with vernacular and traditional built forms, who are not local to a given area, it is virtually impossible to 'know' how such indigenous built forms are constructed. This Portfolio and Analysis is a humble attempt to express our knowledge of *kath-khuni* built forms of Himachal Pradesh.

Analysis 1 Two-dimensional base drawings

The Portfolio begins with the refined digitized technical drawings of the Aukta House. These are two-dimensional drawings to the scale including the representation of building materials and the elements of the house. These drawings are created from the original hand-drawn work of second year students. They are amended and refined to make an accurate visual representation, consistent from floor to floor. The sequence of the drawings follows as 'plans', elevations' and 'sections'.

Plans

A 'plan' represents the footprint of the house indicating the layout and organisation of the spaces. It is the first set of layers of understanding of construction and materials for this built form. Starting with the ground floor plan, the next layer is the reflected ceiling plan of the same floor. Moving up the building, the plan of the mezzanine floor is followed by the subsequent reflected ceiling plan. The next drawings are of the first and second floor plan and their reflected ceiling plans. This part of representations of plans is completed with the roof plan. The viewer sees each floor and ceiling as if they were directly above or below the place.

Elevations

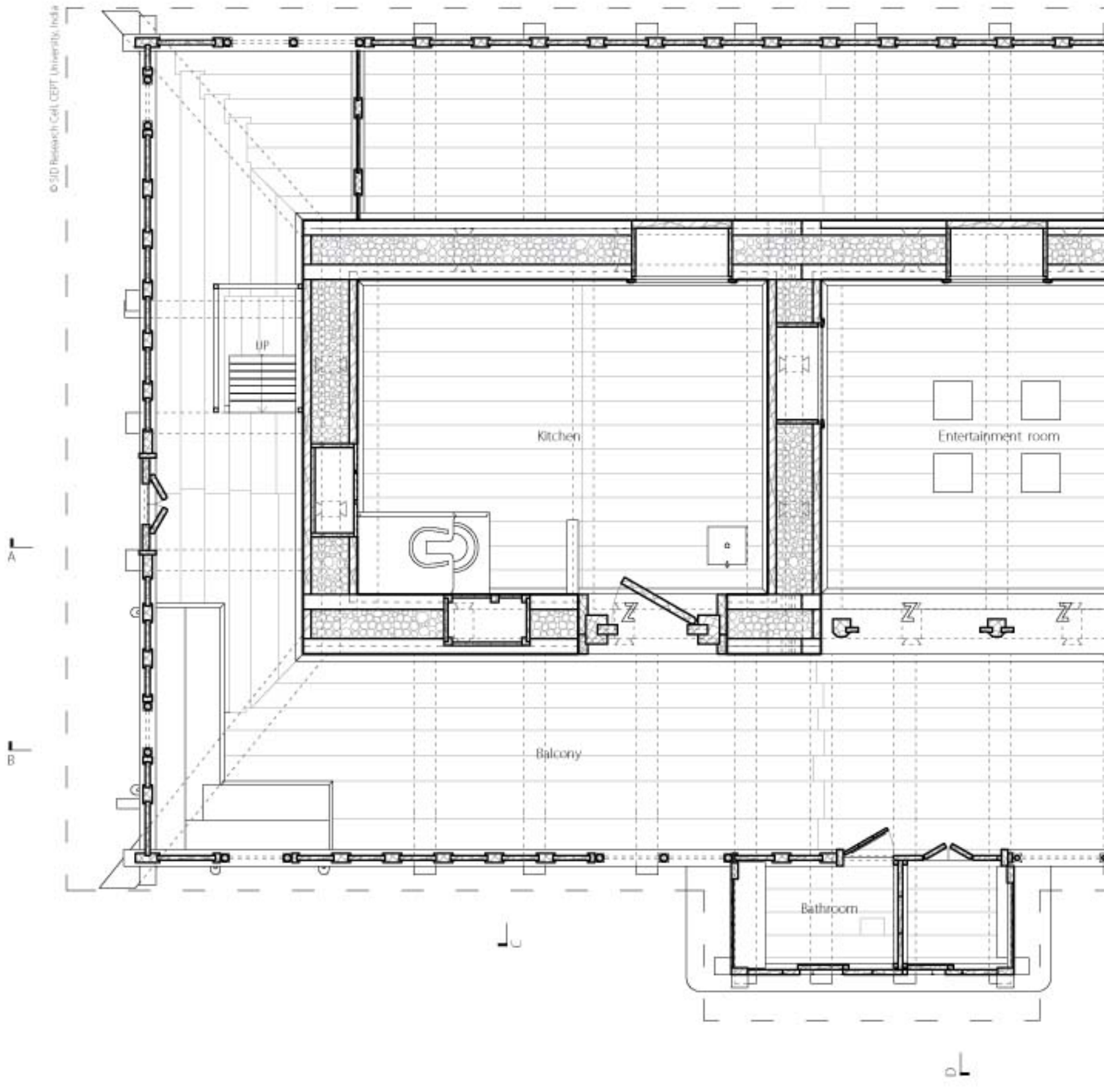
Following the custom of Interior Design presentations, 'elevations' of all four sides of the house constitutes the next part of the Portfolio. They replicate the same system of representation of building materials and the construction of the house as the 'plans'. Oriented as East, West, North and South, these digital drawings to the scale represent the house from side to side viewed from the outside. They indicate each side of the building in reference to the ground.

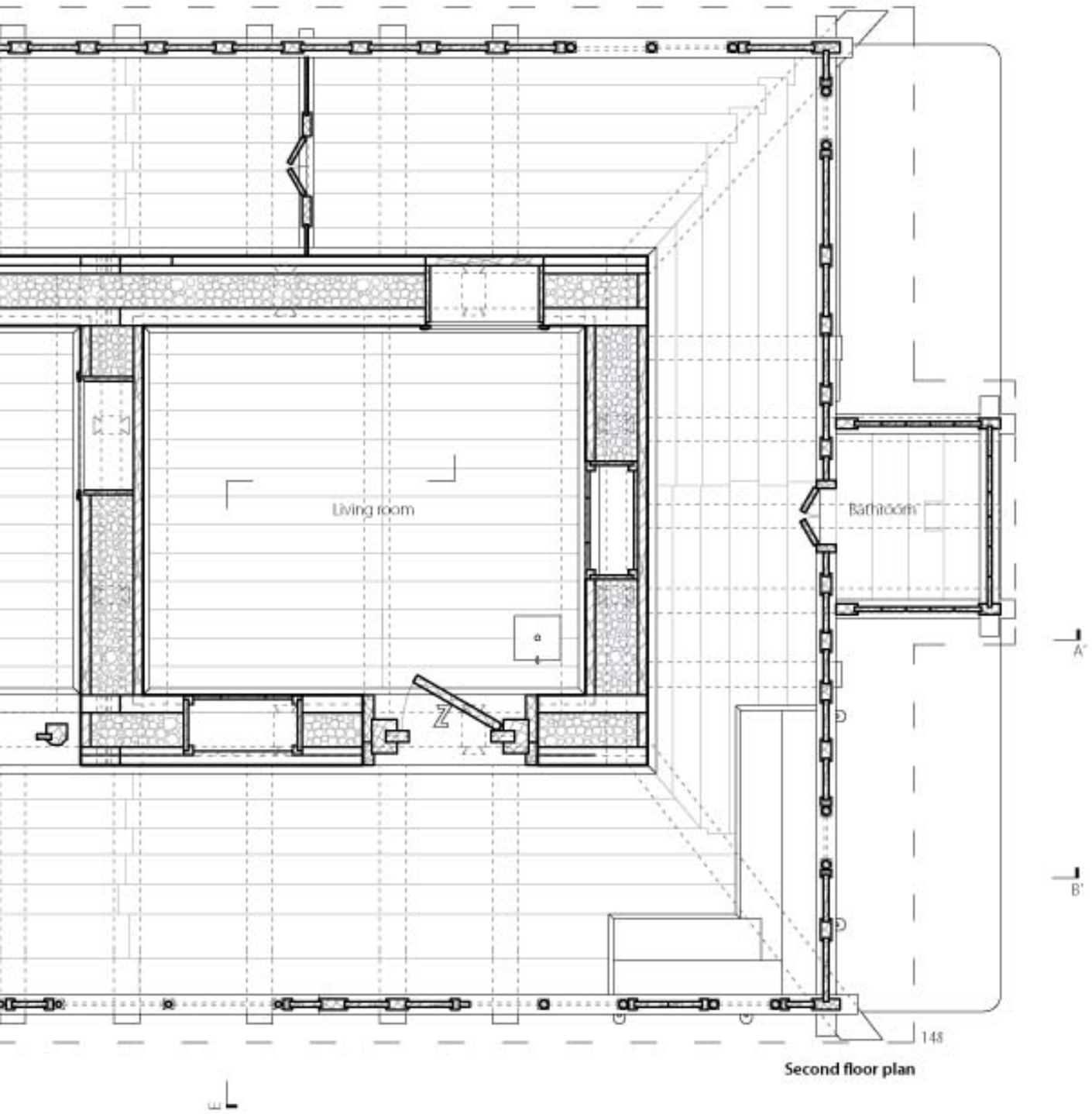
Sections

The 'sections' of the house are as if it were cut like a cake from front to back in two sections and from side to side in four sections. Through this set of drawings, one can begin to understand the interior spaces of the house and their relationship to each other in the whole configuration. The 'sections' are completed with a 'wall-section' image including nomenclature and material representation. This drawing demonstrates how two materials (wood and stone) are integrated and articulated in a *kath-khuni* built form.

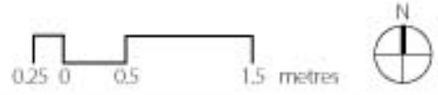
Analysis 2 Folded interior elevations

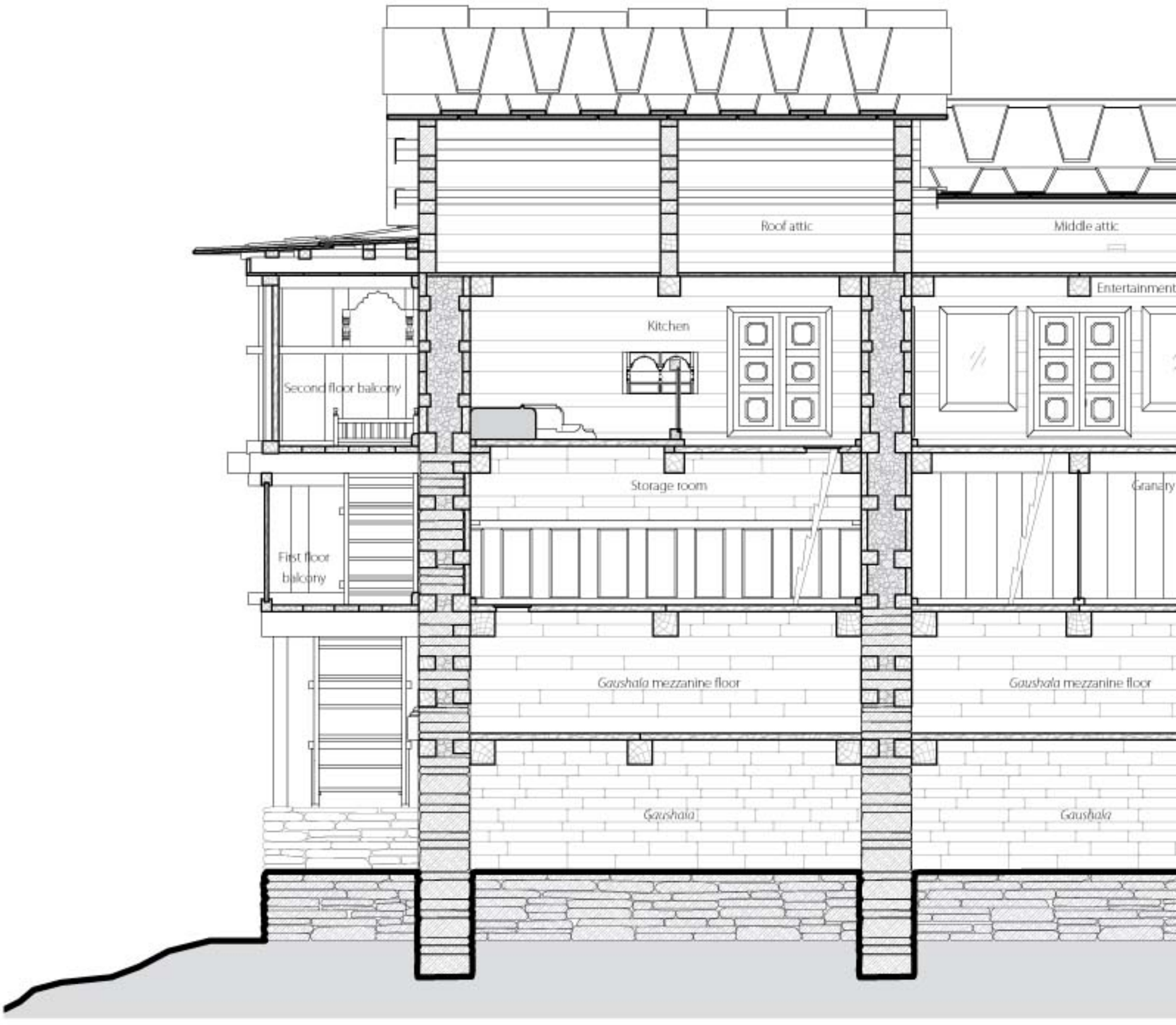
The 'folded interior elevation' is a form of visual presentation most frequently used by Interior Designers. Individual interior spaces within a built form are folded out like a box and made into a drawing. This takes the space apart and indicates the relationships between the

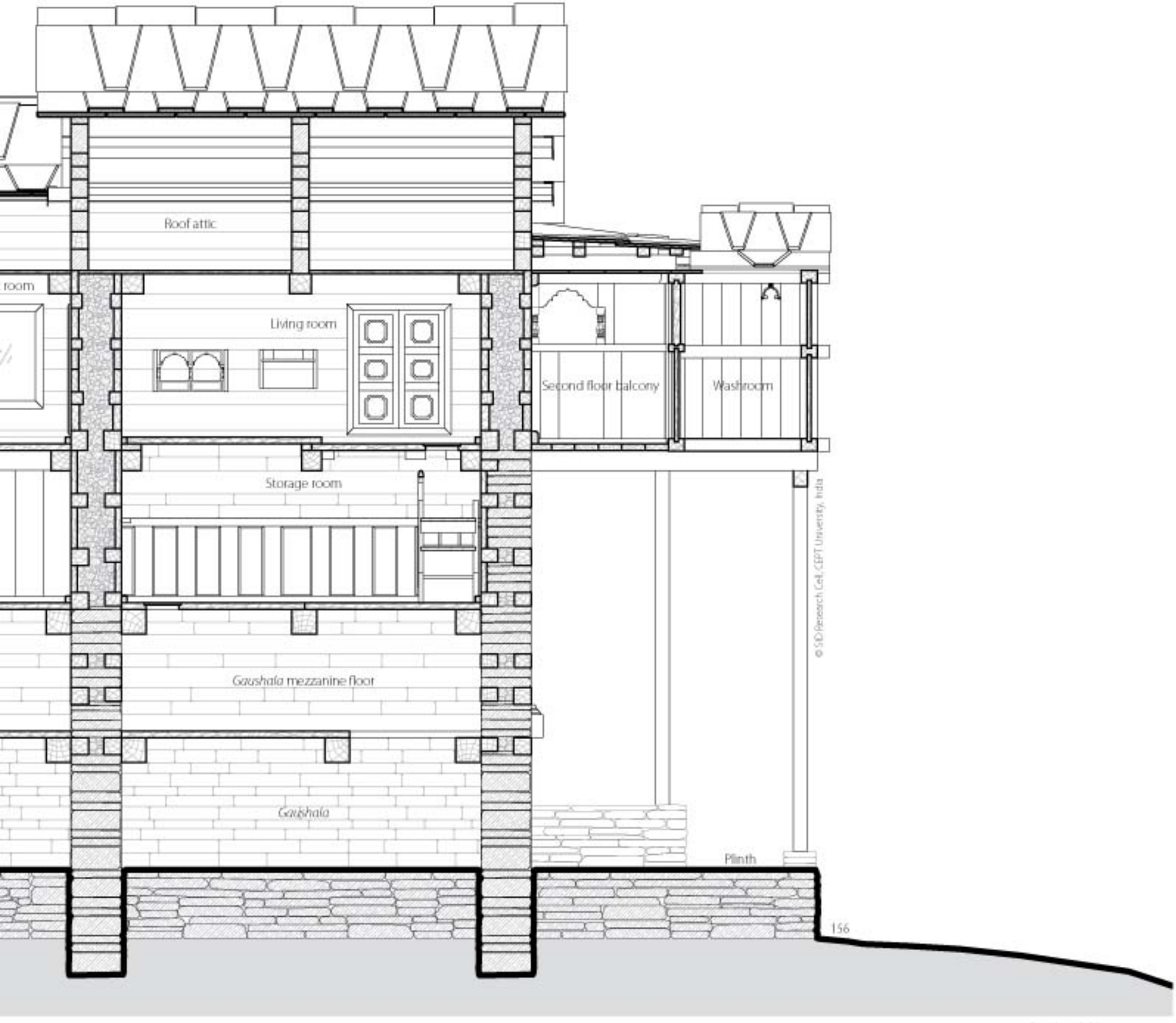

© SID Research Cell, CEPT University, India
UP
Kitchen
Entertainment room
Balcony
Bathroom
A
B



Second floor plan



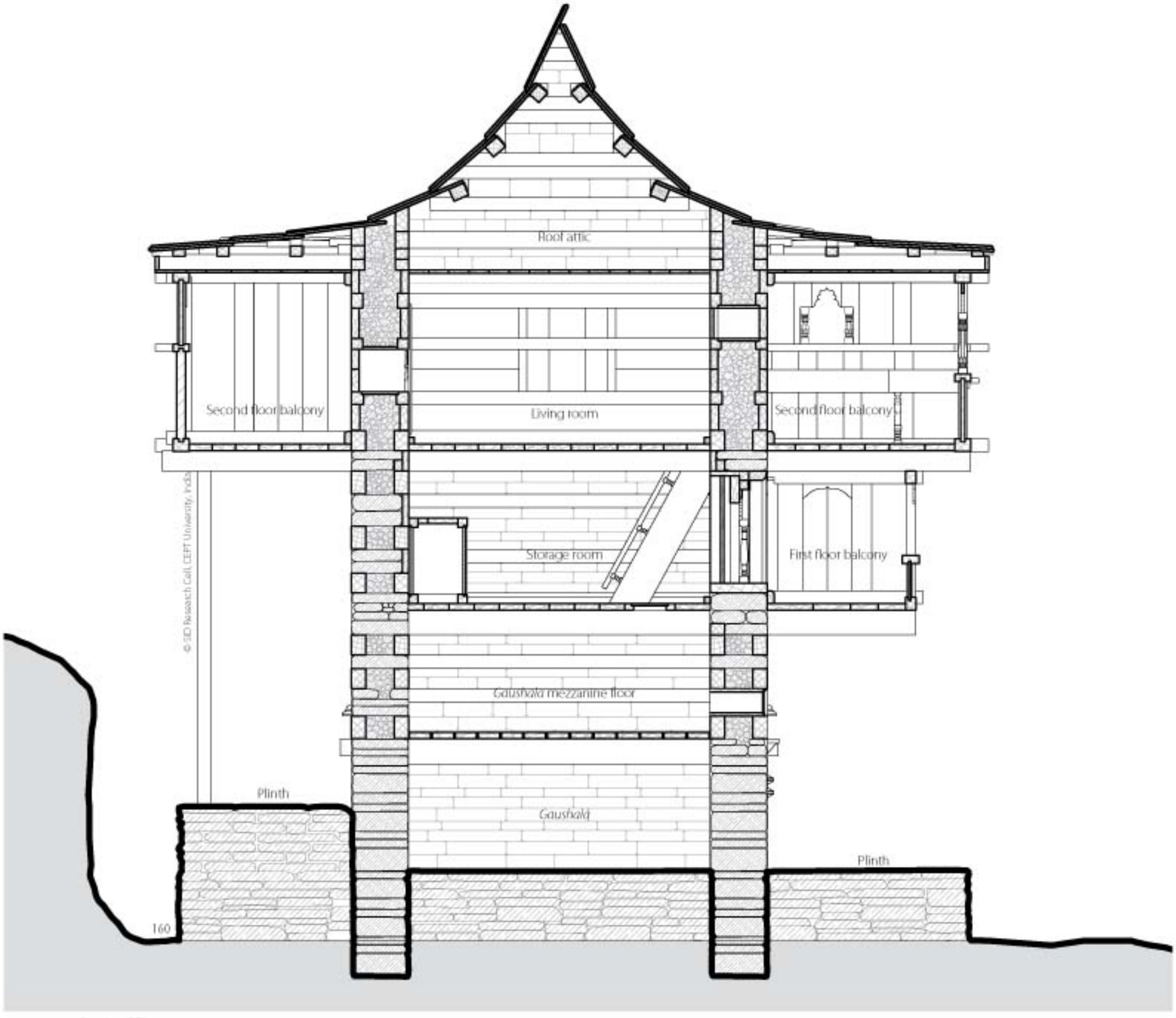

Roof attic
Middle attic
Entertainment
Kitchen
Second floor balcony
Storage room
Granary
First floor balcony
Gaushala mezzanine floor
Gaushala mezzanine floor
Gaushala
Gaushala



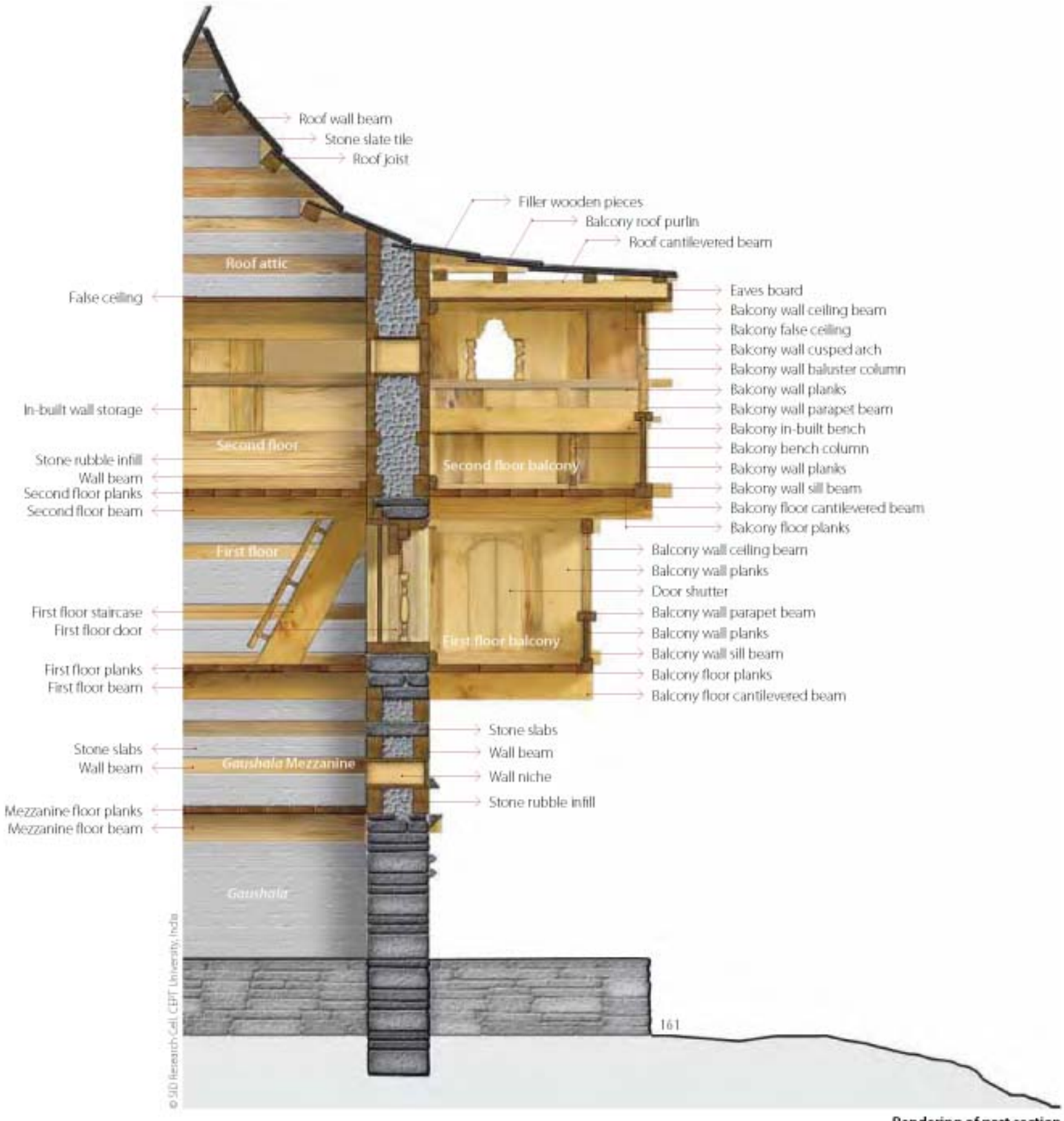
Section AA'

0.25 0 0.5 1.5 metres

Aukta House, Old Jubbal


Roof attic
Second floor balcony
Living room
Second floor balcony
Storage room
First floor balcony
Gaushala mezzanine floor
Gaushala
Plinth
Plinth
160
© SID Research Cell, CEPT University, India

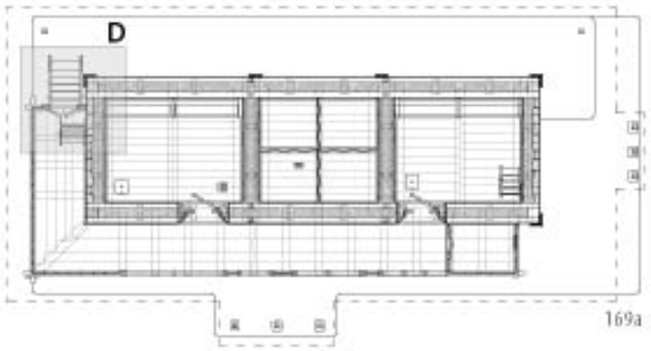
Section EE'



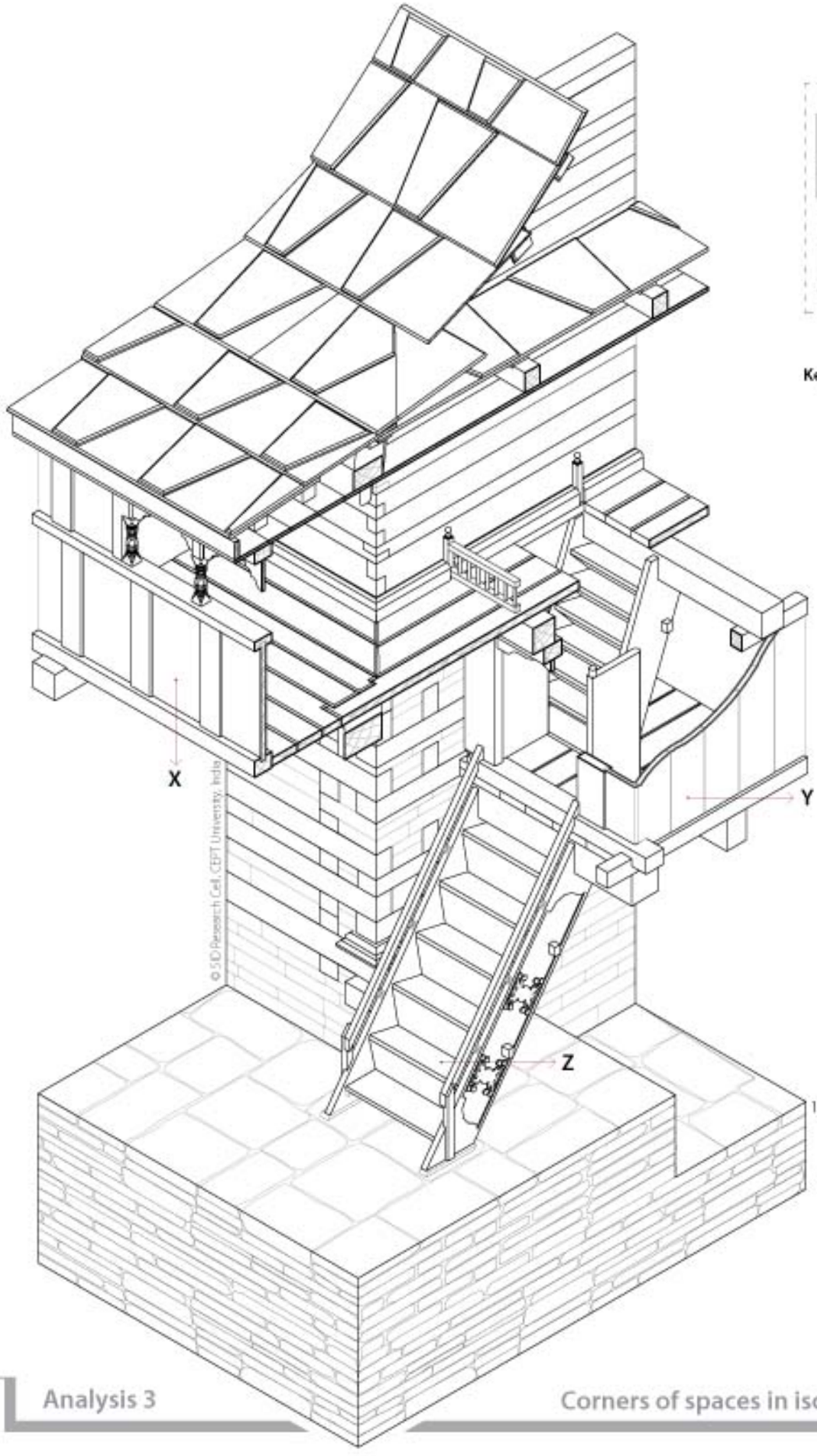
Rendering of part section

0.25 0 0.5 1.5 metres

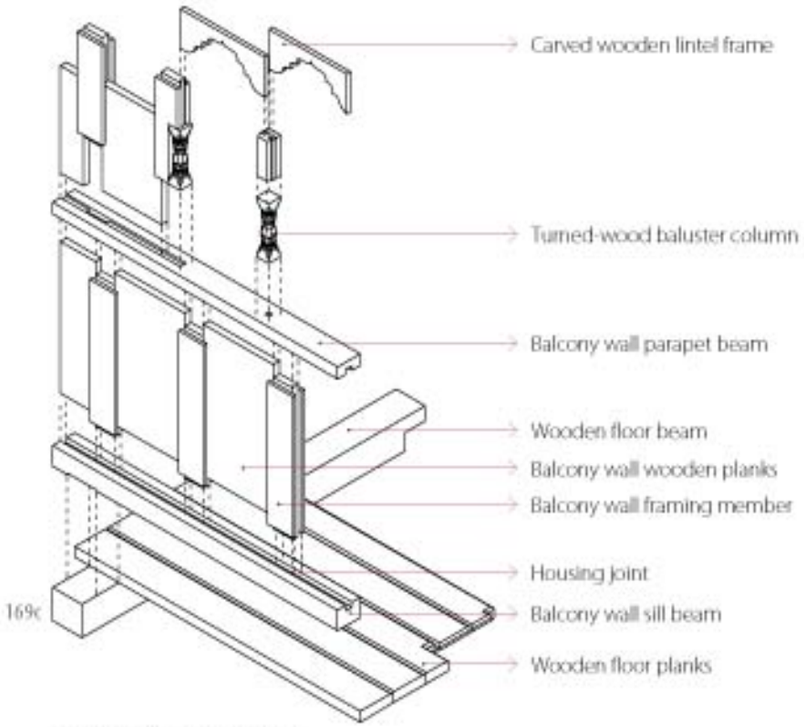
Aukta House, Old Jubbal



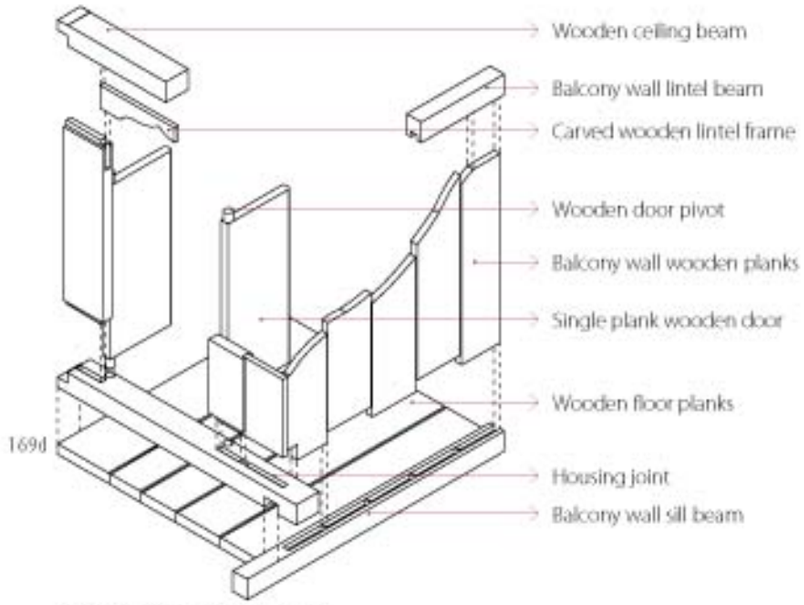
Key first floor plan



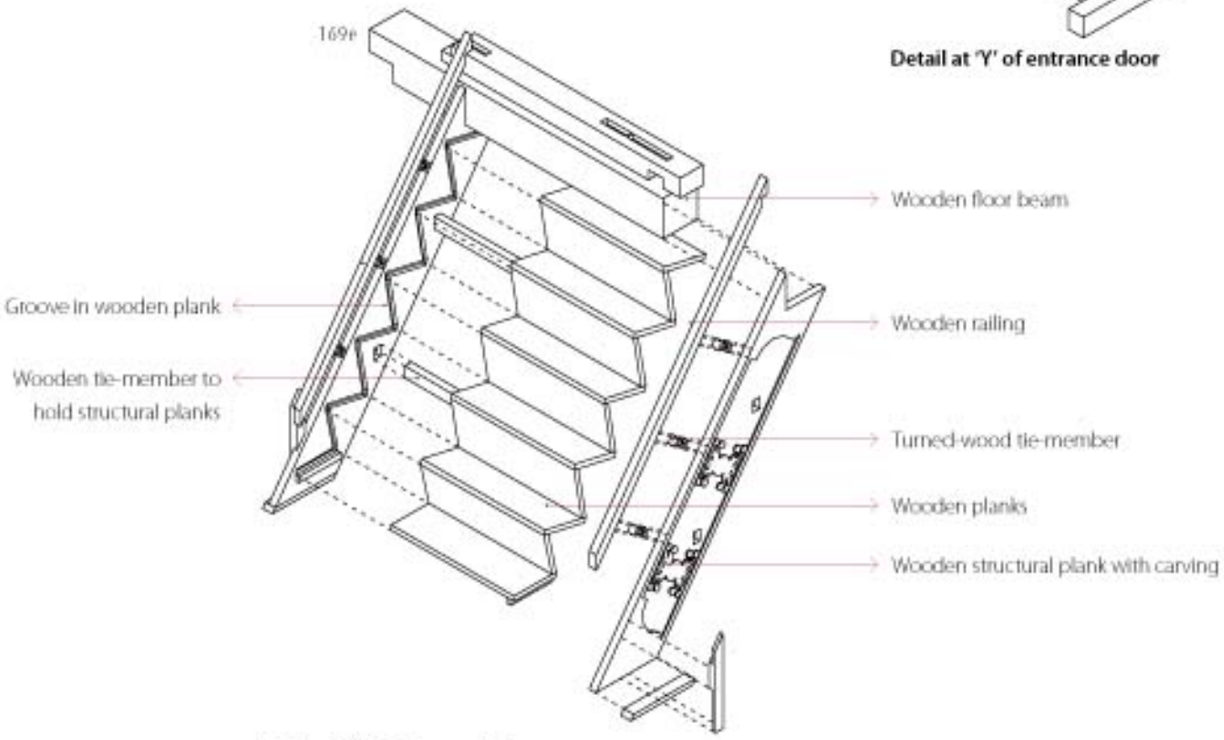
First and second floor entrance corner junction 'D'



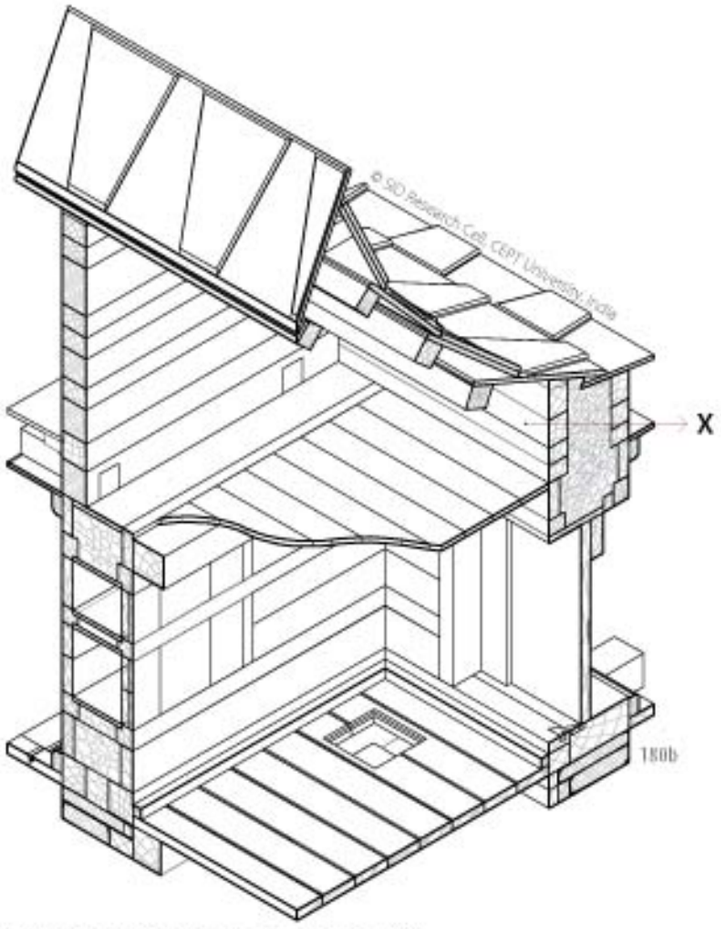
Detail at 'X' of balcony wall



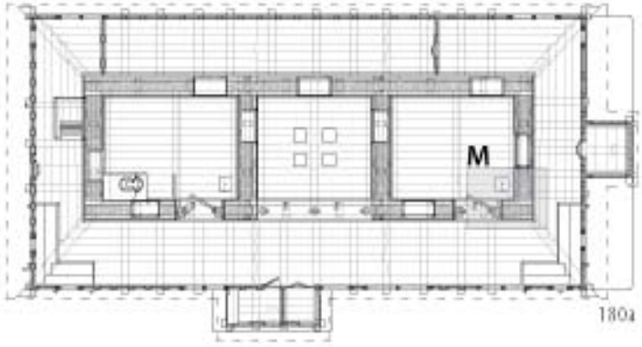
Detail at 'Y' of entrance door



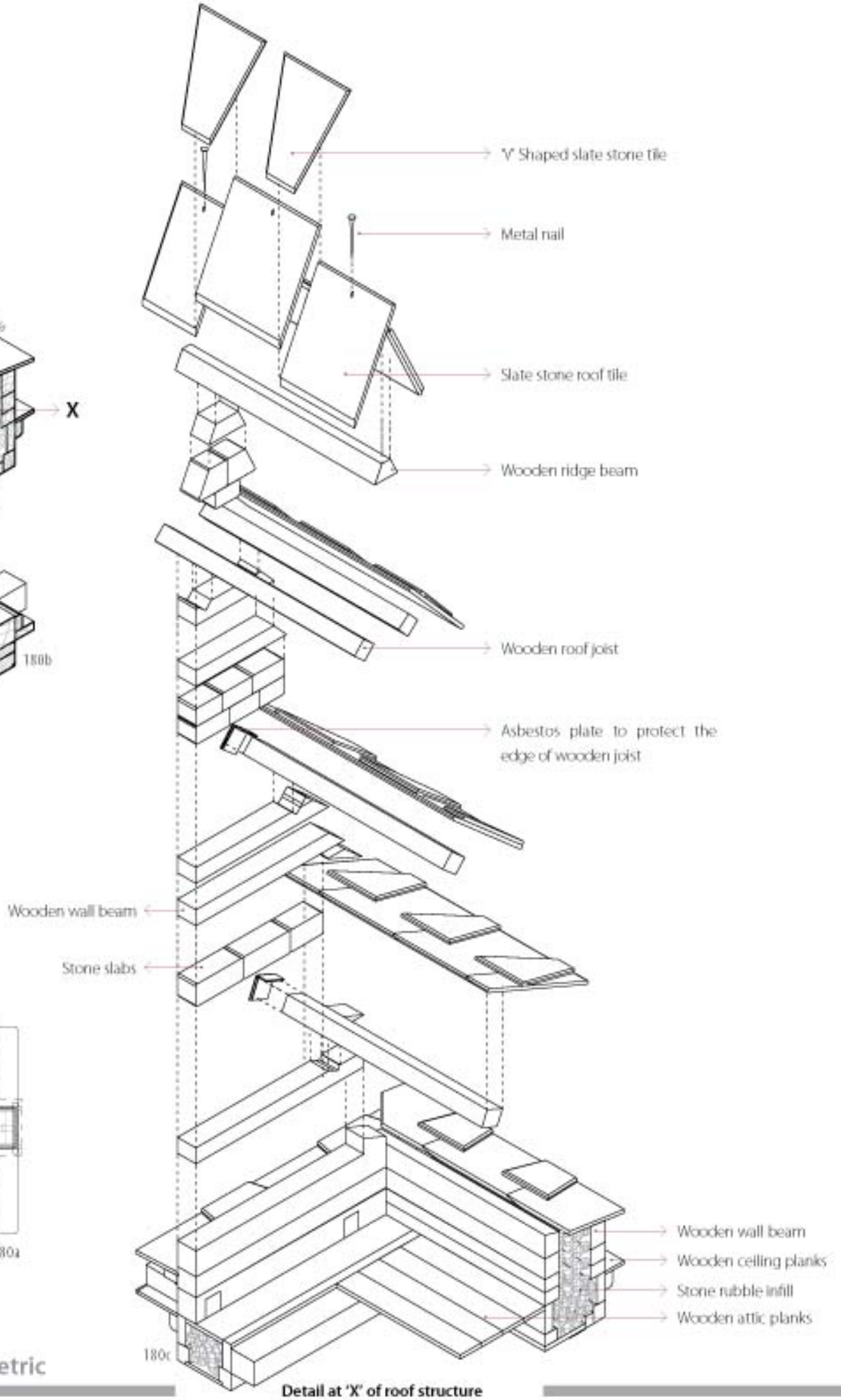
Detail at 'Z' of entrance staircase



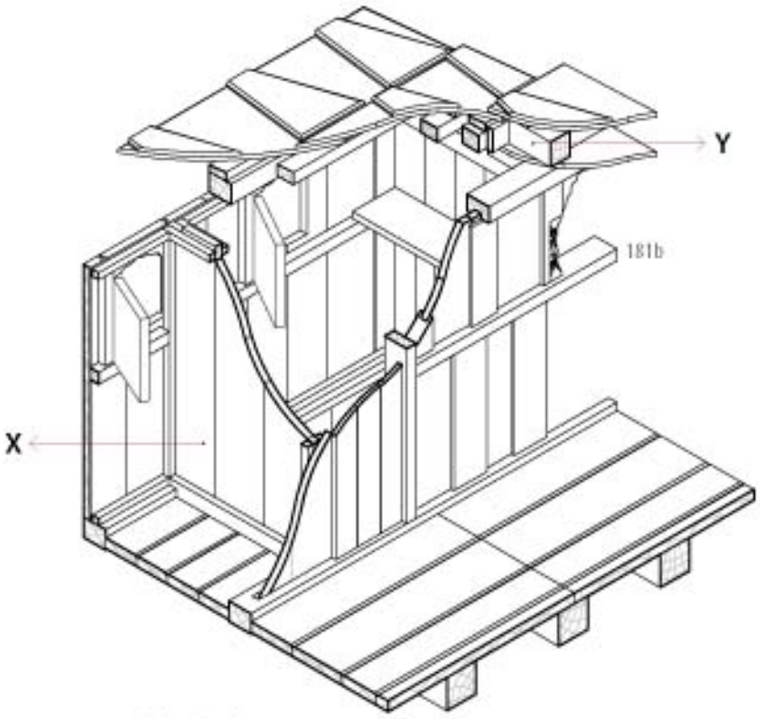
Second floor Living room corner junction 'M'



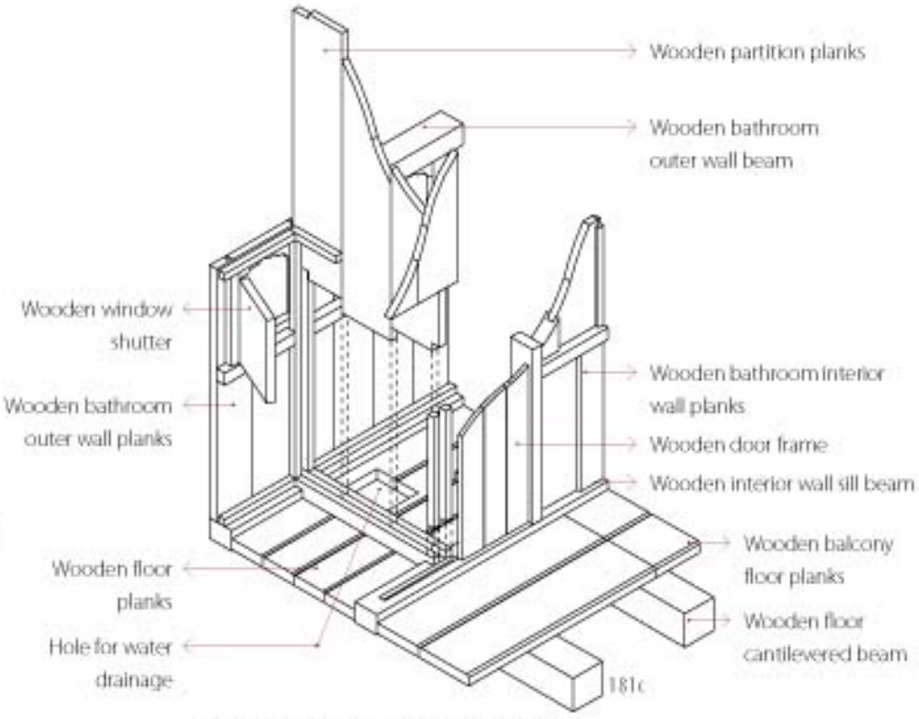
Key second floor plan



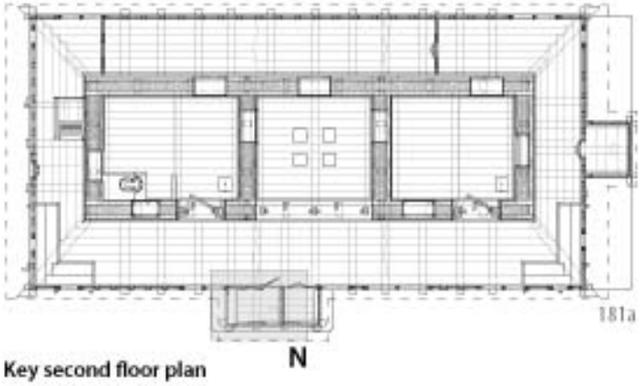
Detail at 'X' of roof structure



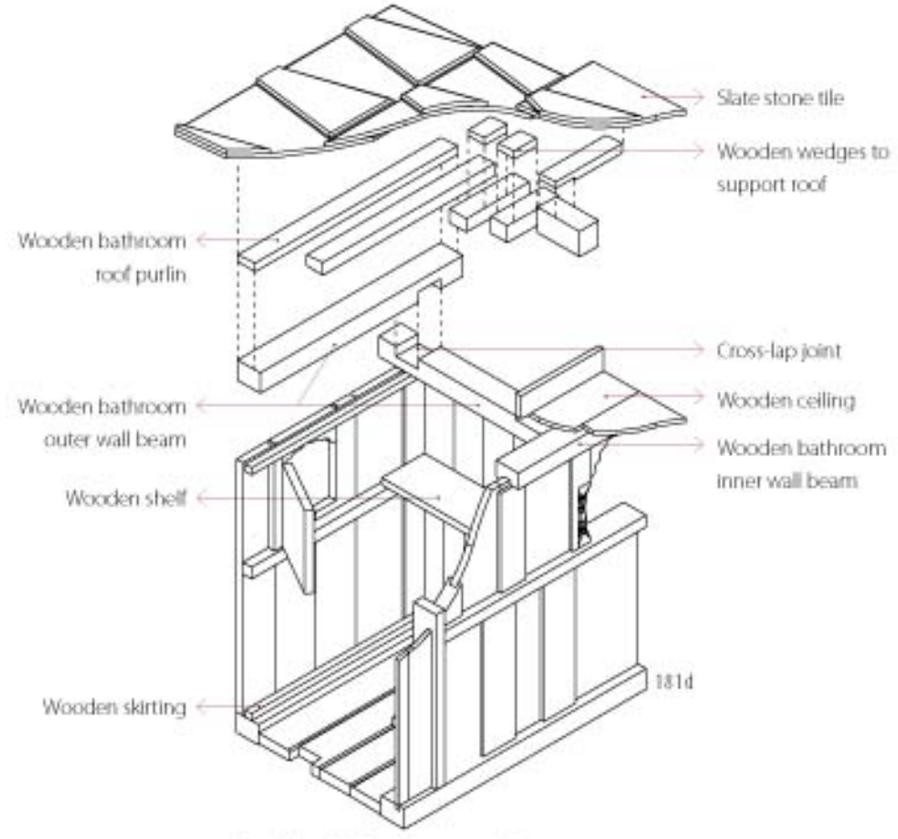
Second floor bathroom outer corner junction 'N'



Detail at 'X' of bathroom partition wall



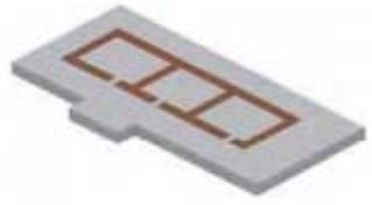
Key second floor plan



Detail at 'Y' of bathroom roof structure

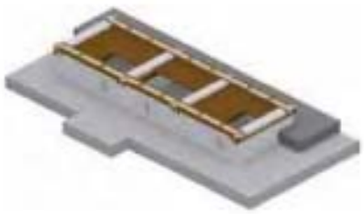
190 (1 to 62). Construction sequence of Aukta House. This is a projected construction assembly of the house showing the sequencing of the elements from the plinth level to the final house form.

190.1

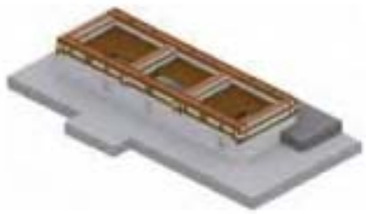


190.2

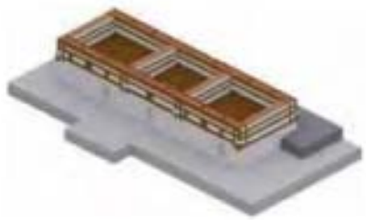
190.7



190.8

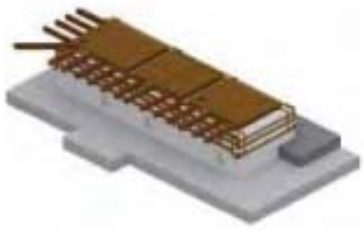


190.9



190.10

190.15



190.16

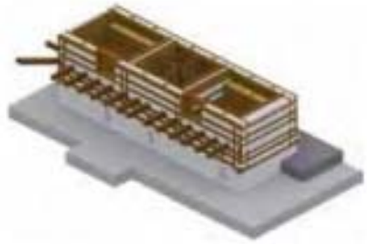
© IDD Research Cell, CEPT University, India

190.17

190.18

190.23

190.24



190.25

190.26

190.35

190.36

190.37

190.38

190.43

190.44

190.45

190.46

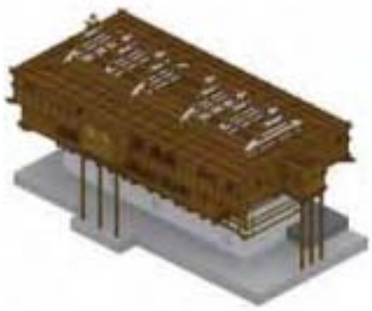
190.51

© SID Research Cell, CEPT University, India

190.52

190.53

190.54

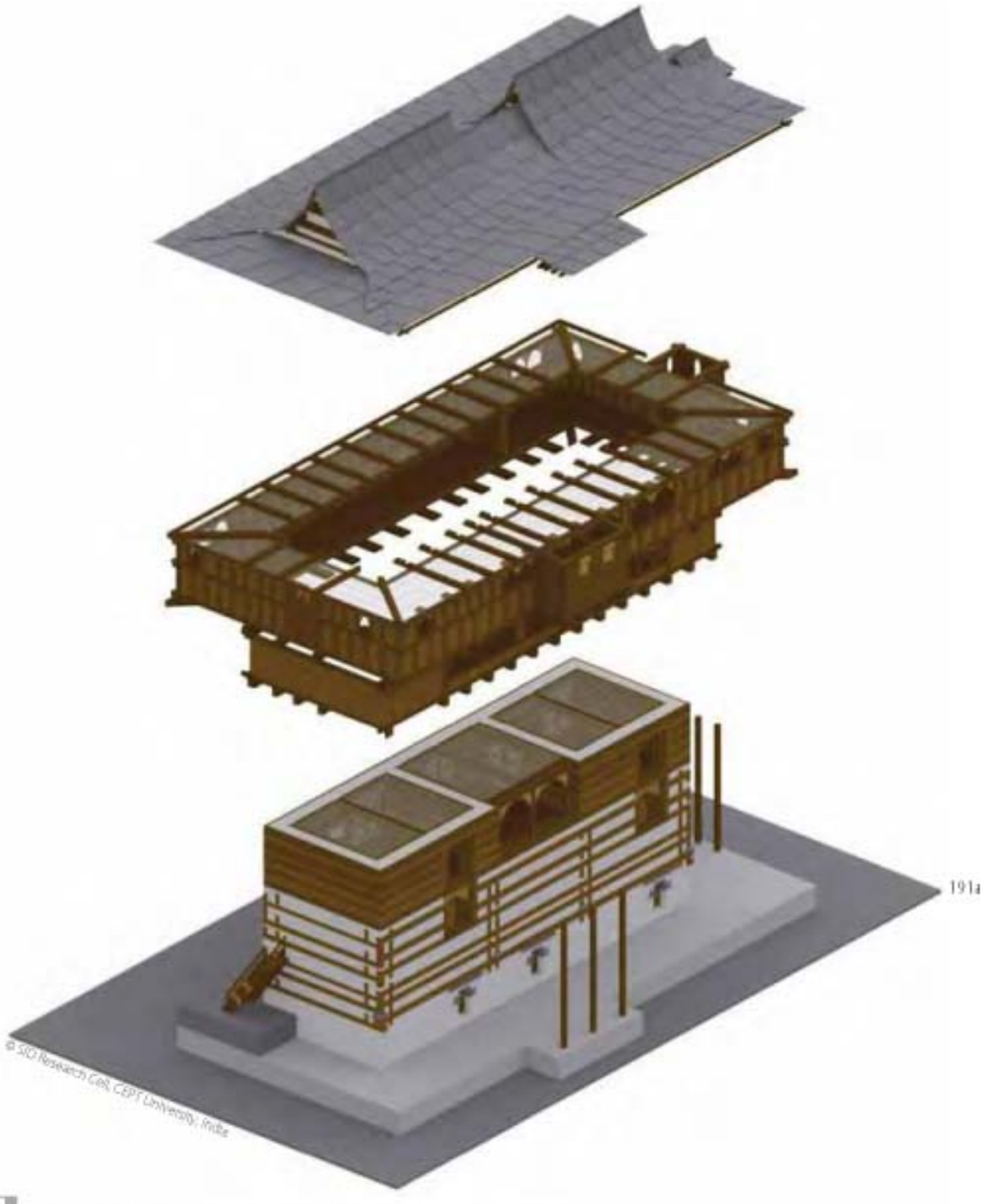


190.59

190.60

190.61

190.62



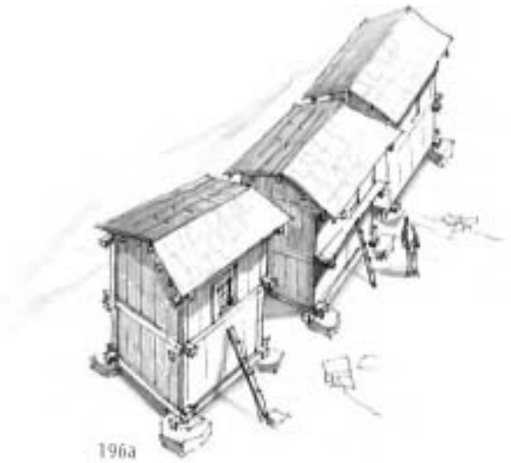
191a. Primary and secondary structure of Aukta House. This exploded view shows the primary structure of the *kath-khuni* house and the attached secondary structure of the balcony. The primary structure is load bearing and remains intact while the cantilevered balcony secondary structure is variable in nature.

© SID Research Cell, CEPT University, India

South west view of Aukta House

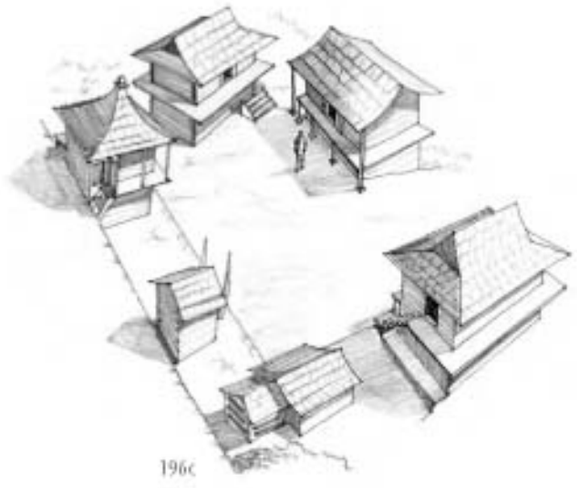
193b

Granary – a shared storage



196a

196b



196c

Finding storage in real time

When observing the way of life in Himachal Pradesh, we came to understand the importance of food (grains) and agricultural products to the survival of people in this place. Food in this region is considered a precious commodity due to the extreme climate especially the long periods of rain and snow. Food is difficult to cultivate in the mountainous terrain. Those provisions not available locally have to be brought in with great difficulty. Consequently, food has social importance because it is also a part of 'trade goods' within the existing medieval barter system. Food is used in exchange for services as well as a means for generating income. The isolated lifestyle and need to store food over long periods of time resulted in the creation of granaries (figures 194 to 196).

We observed two main types of granaries – independent (freestanding) buildings and granaries within the houses. The size and scale of the granary is in direct correlation to the volume of the content to be stored. In Himachal Pradesh houses, the prime criteria in creating spaces is personal security and comfort for daily living. Granaries on the other hand are for food security and the storage of the work from the past, for life in the future. Granaries, with their associated local small temples, are the intersection between houses that guarantee the communities' habitation and large temples that possess the communities' shared beliefs. In socio-economic terms, the granary is the content and the container of the community.

194. (on previous page) **Independent granary with stone roof, Sundagaon Village.** This free standing wooden 'box' is an outside granary, which has stone slabs at ground level that help in reaching the first floor. The slate stone at the base and on the roof protects the wood from heavy rain and snow fall. There is simple floral and geometric carving on the door frame.

195. Independent granary with metal roof, Jhaknoti Village. This typical two-storey structure is made entirely of wood. The sheet metal roof is the new addition; the edges of which are crimped in an ornamental form mimicking the carved wooden roof rafters.

196 (a to c). Types of independent granaries. (a) These are independent free standing wooden granaries with stone tile roof in Pishali. (b) These wooden granaries with stone plinths and roofs in Sundagaon are part of a cluster of family buildings. (c) The communal *wood-and-stone* granary is a cluster of three independent *kath-khuni* storage buildings (on the right) and three small folk temples (on the left) in Old Jubbal.

Measure drawings of a *wood-and-stone* granary

Shri. Mahender Singh Aukta granary, Old Jubbal

In the systematic documentation of the communal granary cluster in Old Jubbal (figures 208, 210, 215), SID team mapped the position of all of the buildings within the cluster in reference to the site. We made systematic drawings of all six buildings; three of which are granaries and three temples – all are different in size and scale. Since the interiors of the three temples and two granaries were not accessible, we made detailed drawings of the accessible granary (figure 210c). Within the granary cluster, the building we measure drew in detail is of the finest quality in terms of expression of material through high quality of construction and craft.

True to the conventional construction system of the villages, the granaries and small temples were constructed in *kath-khuni* method. The organization of the buildings in the cluster is roughly circular. The granaries are on one side and temples on the other and open ground in the middle (figure 196c). The accessible granary that we were able to measure draw in detail is composed of two cuboids stacked on each other with a pent-and-gable roof. The resultant form is that of a miniature version of the houses in the village. The entry to the granary interior space is through first floor open balcony embracing all sides of the building. The door to the granary is accessed by the organically

208

stacked stones making a stairway to the open balcony (figure 199d). This cantilevered balcony, without a parapet, leveled at the average shoulder height of the villager, becomes an active interactive space between the people sitting on it and the ones in the open ground during the festival and leisure time (figure 209). The door in the centre of the first floor defines its interior storage organization. Leaving the central space open and unobstructed, the in-built storage boxes are articulated in inverted "U" shape around the periphery (figures 216, 217). This central space has four lids (trap doors) in the wooden floor allowing access to the four storage units at the ground level. All of the granaries, we saw, had this configuration. The granary also offers a space and an environment that is conducive for the honey-bees to make a beehive in a niche near the entrance on the first level. A small opening is made in the walls to allow the bees to enter the granary.

The finely cut wood used for the container of the granary is of a high quality (figure 212). Carefully dressed stone slabs are inserted in the layers between the wooden beams. Lap joints, housing joints and tongue-and-groove are all used as part of the wooden detailing to create an airtight container. Mud plaster is then used in the interior surfaces to further seal the joints and make them impenetrable.

The small temples alongside the granaries stand as the holders of the mysterious local deities watching over our efforts to understand the storage buildings that are transitional between the secular life of farming and gathering, and the sacred life of a believer in the mountain Gods. The granary temples are kept private for the members of the community. In smaller temples, the local deities are kept in the single level building (figure 210g). Gods belonging to the clan are enshrined in the upper level of larger two-storey temple (figure 210f).

There is a caretaker of the temple and a priest, who performs necessary rituals for each season, festival or special occasion (figure 211). These local deities are a closely guarded secret, because it is believed by the owners that they possess the power to influence the success of a year's harvest and the fortunes of the villagers. It is difficult for the outsiders to know the specific stories attached to this religious imagery. In order to guard their precious beliefs, the sacred spaces in the communal granaries were made inaccessible to the outsiders.

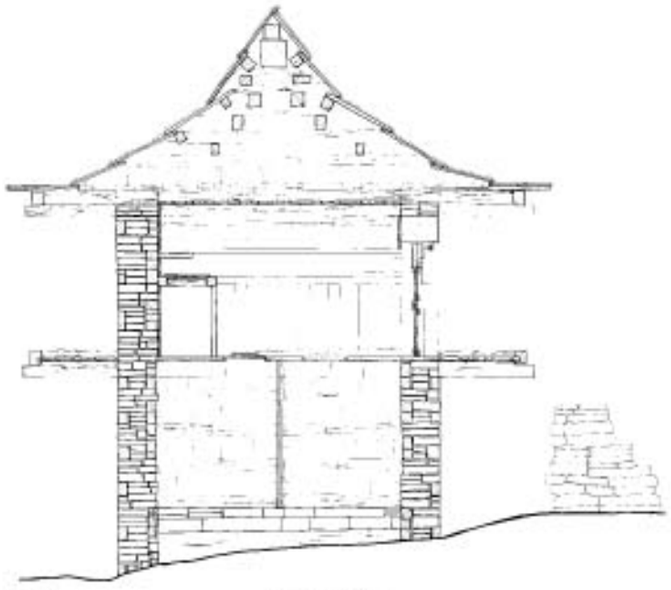
Through the process of measuring, we came to understand how important these tiny temples were to the integrity of the village. The granaries and their associated small temples demonstrate the collective experience of the villagers in dealing with scarcity and in planning for the 'seasons of want'. The local deities are also worshipped in these areas as part of the specific belief system, unique to the members of a community. What we were able to observe was an excellent storage system, air tight and sensitive to the forces of nature and beautiful in its' simplicity. We studied the most basic vernacular built form of Himachal Pradesh, designed with a purpose, built with the collective consciousness of the entire community and providing all that the local people need to survive.

209a

209b 209c

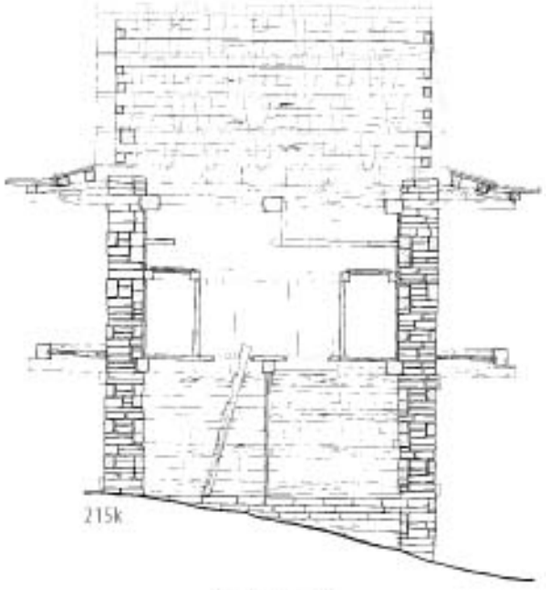
208. Aukta Granary, Old Jubbal Village. This is a view from the village side of a cluster of granaries and folk temples that the SID students measure drew. These *kath-khuni* structures have different types of roofs – gable, pent-and-gable and pent roof (from left to right).

209 (a to c). The family of Shri. Mahender Singh Aukta at the granary, Old Jubbal Village. Members of the Aukta family (a) gather at their granary to demonstrate its features. The eldest member of the family (b) displays the elaborate locking system and the daughter (c) shows the indigenous lock mechanism. Photographs: Eesha Agarwal and Purvi Rathod



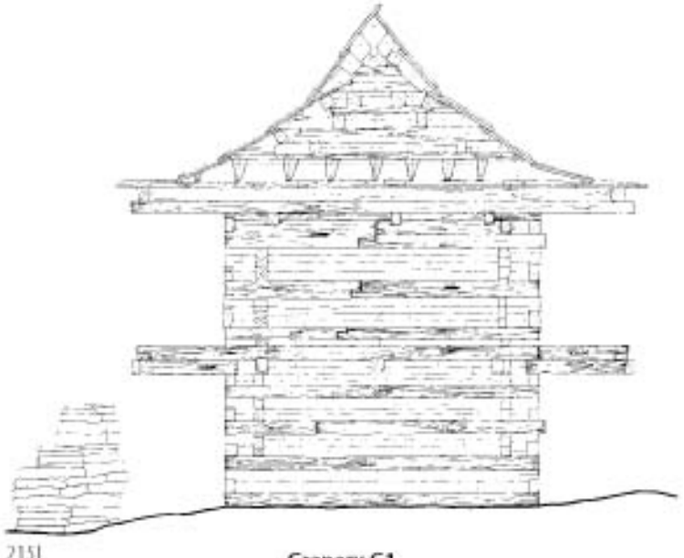
215j

Granary G1
section AA'



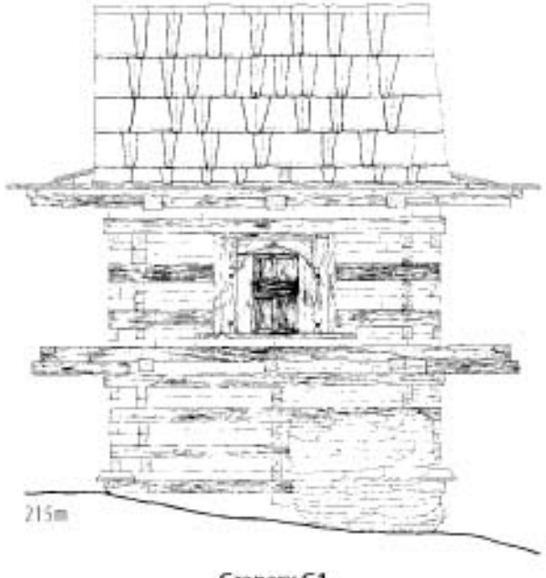
215k

Granary G1
section BB'



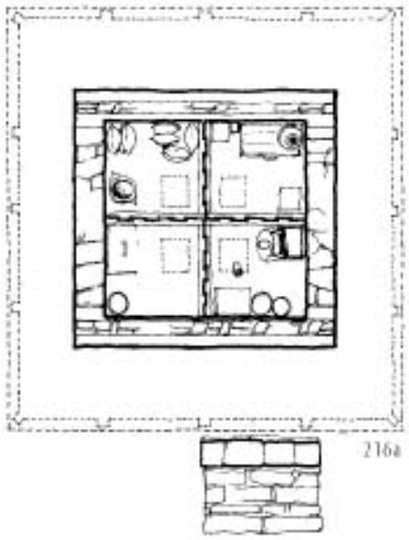
215l

Granary G1
south elevation

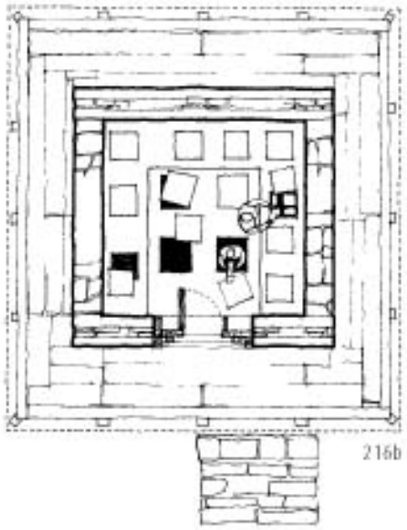


215m

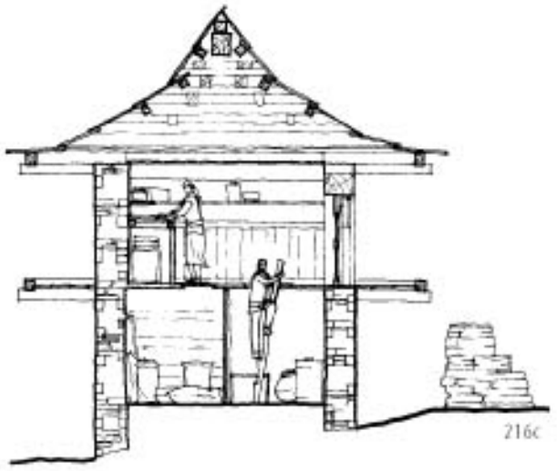
Granary G1
west elevation



Ground floor plan

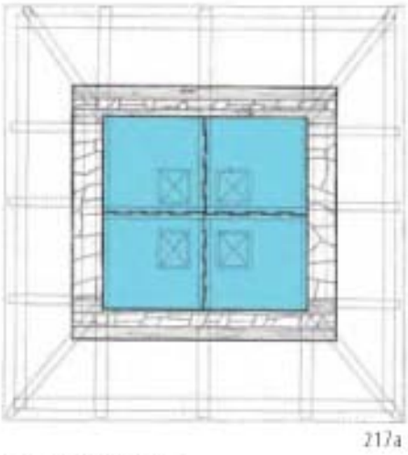


First floor plan

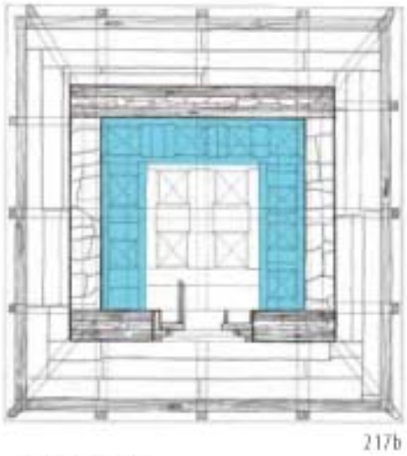


Cross section

216 (a to c). Social use of spaces, Aukta Granary, Old Jubbal Village. Beginning at the ground floor plan (a), first floor plan (b) and cross section (c) of the granary (G1), these illustrations show the use of spaces with reference to a human. The things to be frequently used are stored at the first floor while the ones that have to be retained for a longer period are stored at the ground floor.



Ground floor plan



First floor plan

Cross section

217 (a to c). Indication of storage areas, Aukta Granary, Old Jubbal Village. The blue colour indicates where the storage spaces are throughout the building plans and sections.

Storage area

Note: Schematic illustrations 216 and 217 are not to scale

Shri. Mahender Singh Aukta Granary, Old Jubbal

219

220

221

218. (on previous page) **Prashar Rishi Lake Temple complex, Mandi District.** This spectacular temple complex is located at an altitude of 2700 metres. It houses Prashar Rishi temple. In this complex, new buildings are being built using *kath-khuni* construction techniques and local materials. This temple complex is an example of the tradition of constructing religious buildings at remote locations.

219. Lakshana-Devi Temple, Bharmaur Village. In the 2005 study trip, the SID team visited this ancient gable roof temple. It has extensive classical woodcarving that resembles the carvings at the Shakti-Devi Temple at Chhatrari. The temple is located in a complex, which houses eighty-four (*chaurasi*) temples of different styles, made of stone and wood.

Wooden and *wood-and-stone* temples

Finding a place for the Gods

Himachal Pradesh, amid the Himalayan mountain range, is a land of the Gods. Hindu temples of many types, from the rock hewn ancient forms brought from the plains of India to the *kath-khuni* temples in a village to the folk temples in a granary cluster, are found in this spectacular land of the southwestern Himalayas.

The temple is the pilgrimage point, a place of worship on the highest and most revered ground. The temple is where the past intersects with the present through beliefs, historical time, religious rituals and the importance of Kings and patrons. It is an exploratory workshop of the greatest craftspeople and artists as well as the sincere efforts of the ordinary local people. The temple connects houses and granaries to the Gods and protects those who come within the sight of the holy ground. The more remote the location, the greater the desire to be close to the Gods and the more intense the forms of worship are expressed in temple buildings.

The Hindu temples in Himachal Pradesh are built at the interface of two belief systems, those of the local inhabitants and those of high culture brought in by the power and affluence of Kings of the past. There is a also third belief system, that of the state, managing many of the oldest temples to 'preserve them for future generations'. There are many more layers of beliefs connected to temples and shrines in this region. Local people feel the forces of their beliefs motivated by adaptation, isolation, necessity and creation. The people of Himachal Pradesh, as indigenous people all over the world, need something bigger than themselves to watch over the physical aspects of their lives where they do not have control. This is a how local temple, folk deities and secret places of worship came to be an integral part of Himachal Pradesh.

For the purposes of our study, we are looking at wooden (figures 218, 219, 241) and *wood-and-stone* temples (figures 220 to 227, 229), since they were the most highly developed aesthetic form of the *kath-khuni* built environments, measured by the SID team. The wooden temple here refers to the type of temple where wood is used as the primary material of construction for the structure. Stone is used only in temple foundations and roofs as slabs and slate stone shingles similar to the independent granaries. SID team measure drew the wooden temple in Chhatrari and the previously undocumented *wood-and-stone* temple in Kiari. The *wood-and-stone* temple follows the same construction system as the *kath-khuni* houses and granaries and demonstrates that the local builders have put the maximum effort to surpass the grandeur of their houses and granaries in these temples.

220. Shiva Temple, Jubbal Village. This pent roof temple is consectated to *Shiva*. The *kath-khuni* structure has a *verandah* on the ground level, which is like the balconies on the vernacular houses, including wooden spindles and arched divisions of the panels carved with floral motifs. It has a finely moulded stone plinth.

221. Mahasur Devata Temple, Old Jubbal Village. The main temple on the left of this photograph is a *kath-khuni* built form with a semi-enclosed balcony on the first floor and a pent roof. Three gable roofs temples for the local folk deities in consecutively decreasing sizes are situated on the right. These temples are well maintained by the local community. Photograph: Kireet Patel

222. Pent-and-gable roof temple, Dhagoli Village. This small and elegant temple is situated in the heart of the village. Almost all the built forms in this village including this temple are *kath-khuni* structures. Photograph: Smita Agarwal

222

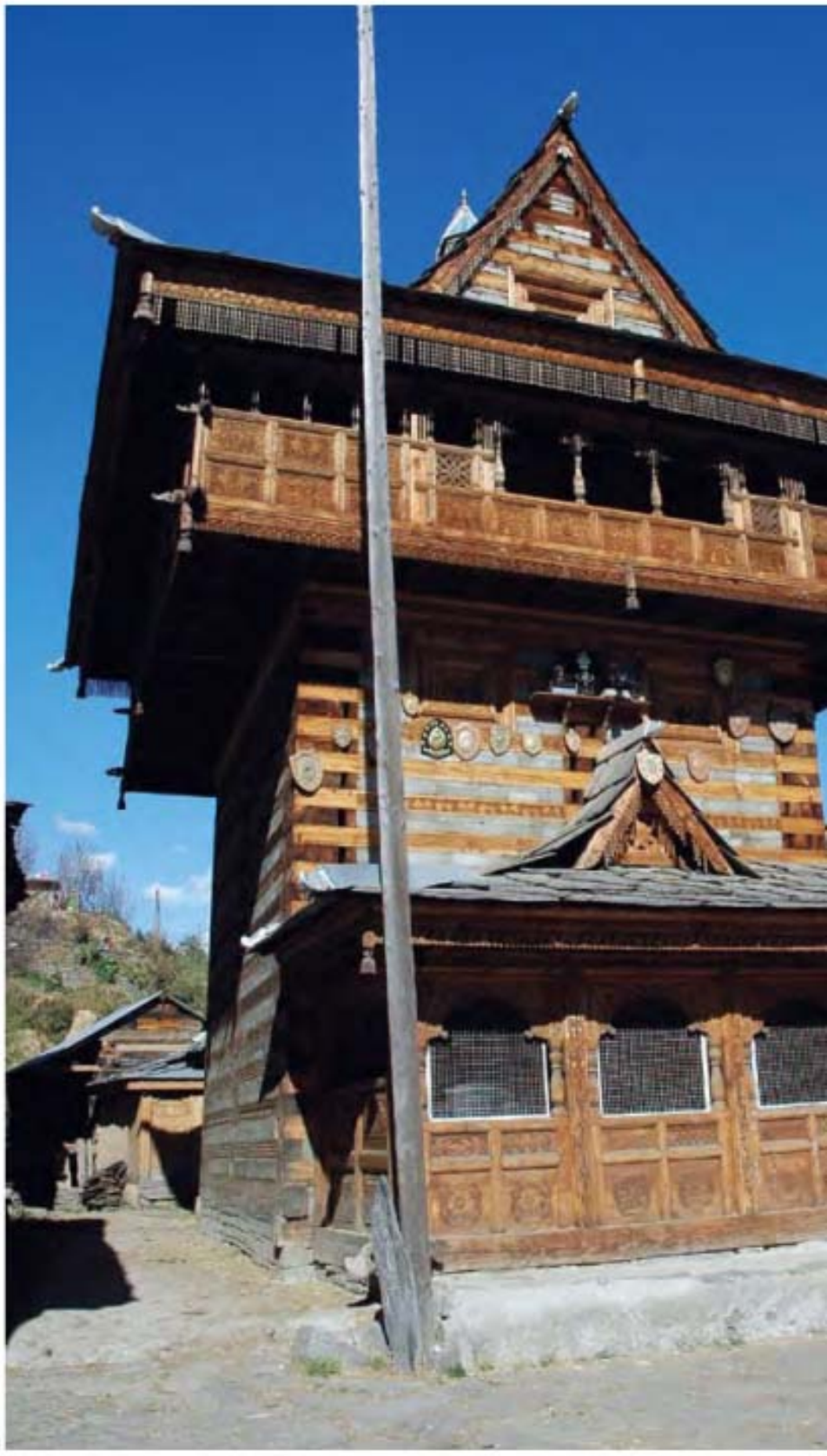
223

Our SID team visited many more temples (including stone temples) than those described in this study. The visits were done in order for the faculty members and students to understand the range of types of temples in Himachal Pradesh. Observing and studying these diverse types helped us in identifying the influences of classical temple design brought from other parts of India on local temples. The visits to the stone temples gave us a historical context for the spread of Hinduism, repetition of various ornamental forms and recurrence in the organisational patterns in the temples of this region. To discuss every type of temple seen on the study trip would take a separate monograph. Eminent scholars have examined the temples of Himachal Pradesh for over one hundred years.[1] Our purpose is not to replicate their findings but rather to take a fresh look at a small cross-section of wooden and *wood-and-stone* Himachal temples.

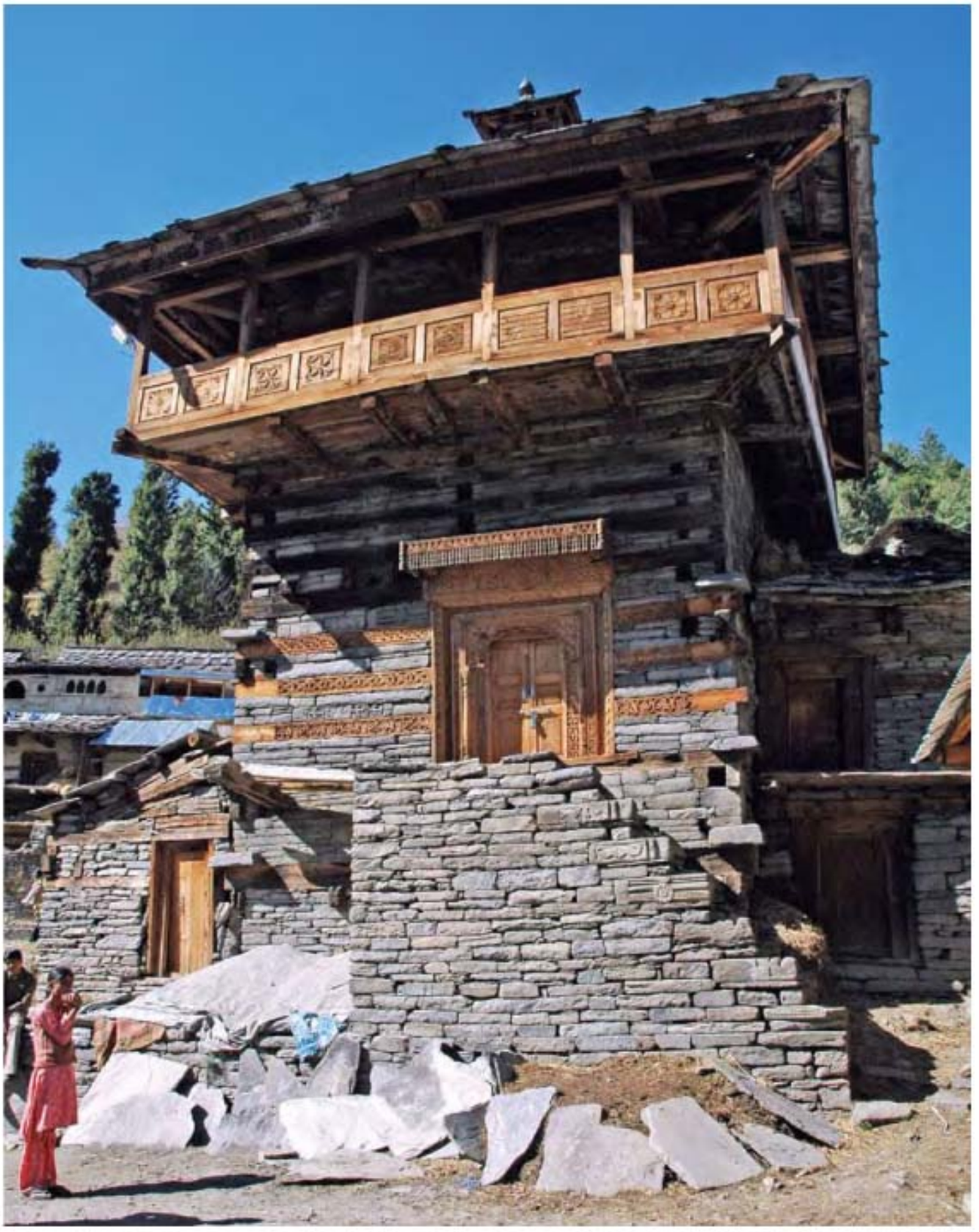
223. Pent-and-gable roof temple, Matwani Village. This temple has *kath-khuni* walls with a cantilevered balcony with arched openings in the parapet wall; the panels of which are adorned with folk figures. The carving of the edges of the wooden rafters and the cone cap on the ridge beam are the distinctive features of the temples within this region. A notched wooden log is used to access this temple.

224. Tower temple, Jhaknoti Village. This tall *kath-khuni* Tower temple has an overhanging cantilevered balcony. The lower and upper roofs are pent-and-gable. The front facade is adorned with many shields prominently displayed. The temple is abundant with folk woodcarving. Carving on the external wooden structural beams is a feature that is usually observed only in temples. Such temples often have hanging wooden pendants at the eaves board, which rattle with the wind.

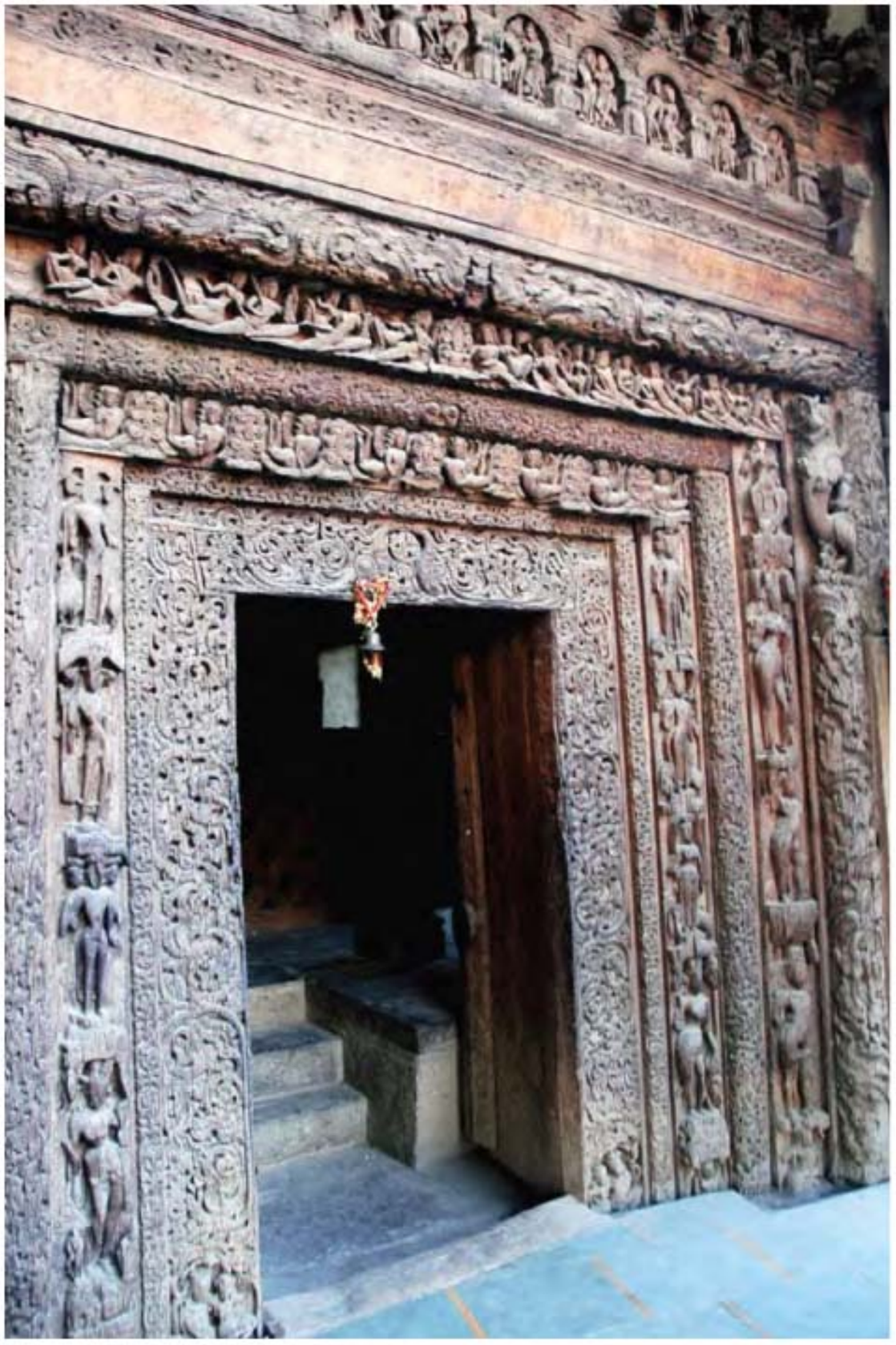
225. Tower temple, Dhagoli Village. This temple with a solid stone base and a cantilevered balcony can be approached through large stone steps. This is an example of seismic design with heavy stone at the bottom and more wood as the building progresses upward. The temple is being restored at the lower level including the woodcarving of the structural beams.



224



225



230a

230b

230c

230d

230e

and administrators of the area. Prior to India's independence, local people were required to give up several days each year for the building and maintenance of temples. Same activity was also carried out for the collective buildings maintained in the village (granaries, schools and other public buildings). In exchange for their labour, the rulers protected their property and the priests protected their souls from the unpredictable natural elements of their world.

Although the overriding structures of this medieval guild system have ceased to exist, the will of the people to practice the system of barter and exchange remains. The temples in this study are very much informed by their surrounding vernacular built forms and by the ways of construction. Not only are the local materials (deodar wood and slate stone) used to build them are same but also much of the construction techniques and the builders from the community are the same.

Woodcarving is the primary visual narrative form in these temples of Himachal Pradesh (figures 230 to 232). In the large temples, SID team visited, we found carving on the doors, structural beams, columns and the ceilings. A combination of classical imagery from Gods and Goddesses, their associated animals and plants, festivals and battles, mythical creatures adhere to the proportion and scale of the structure they adorn. Folk carving from local wood carver is also found in these temples either as part of a community ritual of rejuvenation to keep the temple building traditions alive, or as a replacement for damaged and aged carving or as new additions to demonstrate the skill and faith of contemporary craftspeople.

For centuries, Kings and courts patronized artistic woodcarving in temples. The religious iconography and the sequencing of motifs revealed the skill and knowledge of the craftsmen. Recently with the end of the princely states, either the upkeep of these temples has become a National Government responsibility (ASI) or the temple is in the hands of the community whose resources may not meet the needs of the aging temple. Woodcarvers are finding it hard to make a living and so they are turning to other professions.

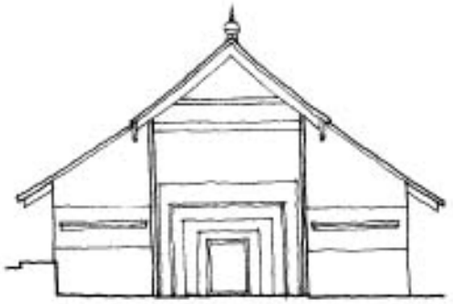
230 (a to e). Classical woodcarving, Lakshana-Devi temple, Bharmaur Village. Brought by the kings and religious leaders of the 7th and 8th centuries, woodcarvers trained in carving of classical forms of Hindu pantheon created the original doors of these early wooden temples. Gods, mythical creatures and symbolic flora and fauna and objects are intertwined throughout the layers of the doorway (a) of the this temple. Heraldic lion (*shardula*) is the most prominent feature of the exterior (b) and interior door frame (c). Various poses of human figures (d), floral scrolls, interconnected narratives and mythical forms like *vidhyadharas* (celestial gods) (e), composed on the either side of the sacred tree motif, are observed on the lintel of the door and facade of this temple.

234 (a to v). Typology of wooden and *wood-and-stone* temples in Himachal Pradesh. This is a typology of temples by visual identification: (a to d) gable roof, (e and f) pent roof, (g to n) pent-and-gable roof, (o and p) composite roof, (q to t) tower temples and (u and v) multi-tiered pyramidal roof temples.

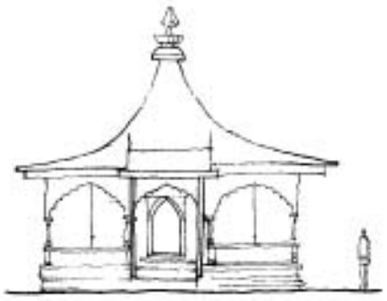
234a

234b

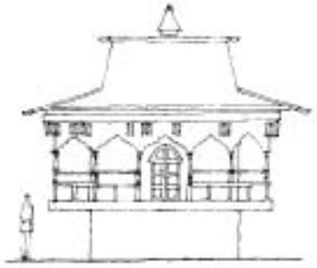
234c



234d



234e



234j

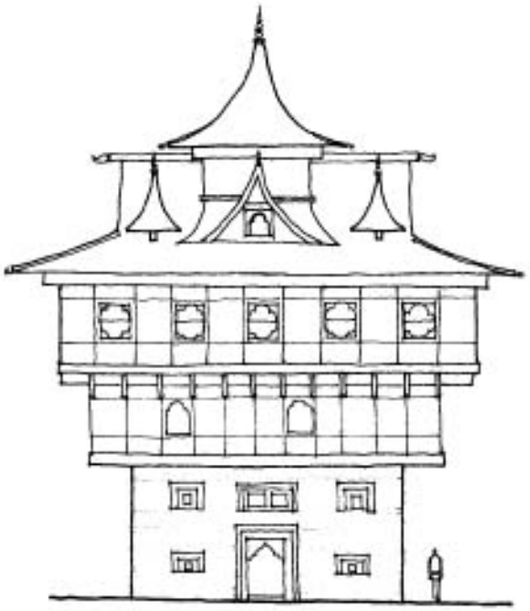
234k

234l

234m

234q

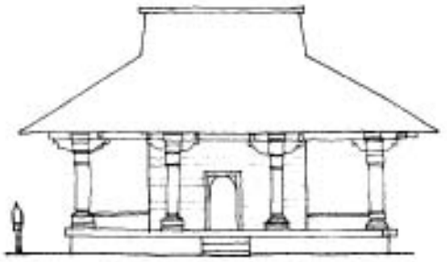
234r



234s

234f

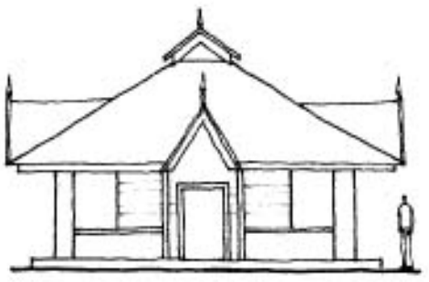
234g



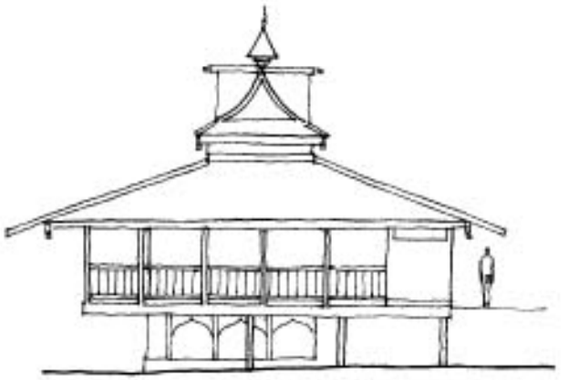
234h

234i

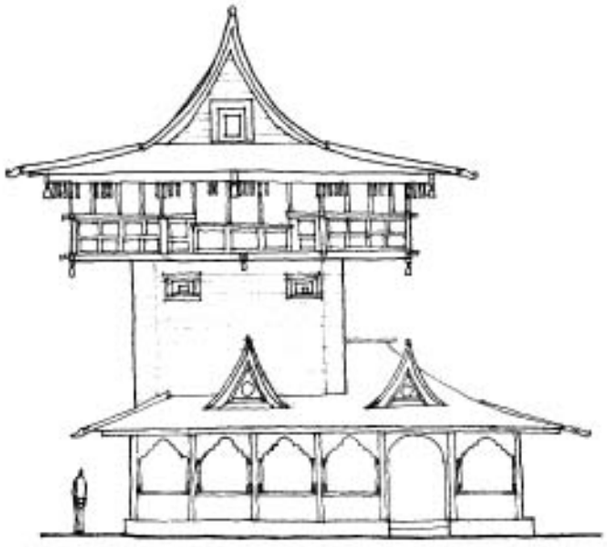
234n



234o



234p



234t

234u

234v

235a

235b

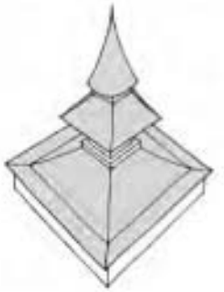
235c

235d

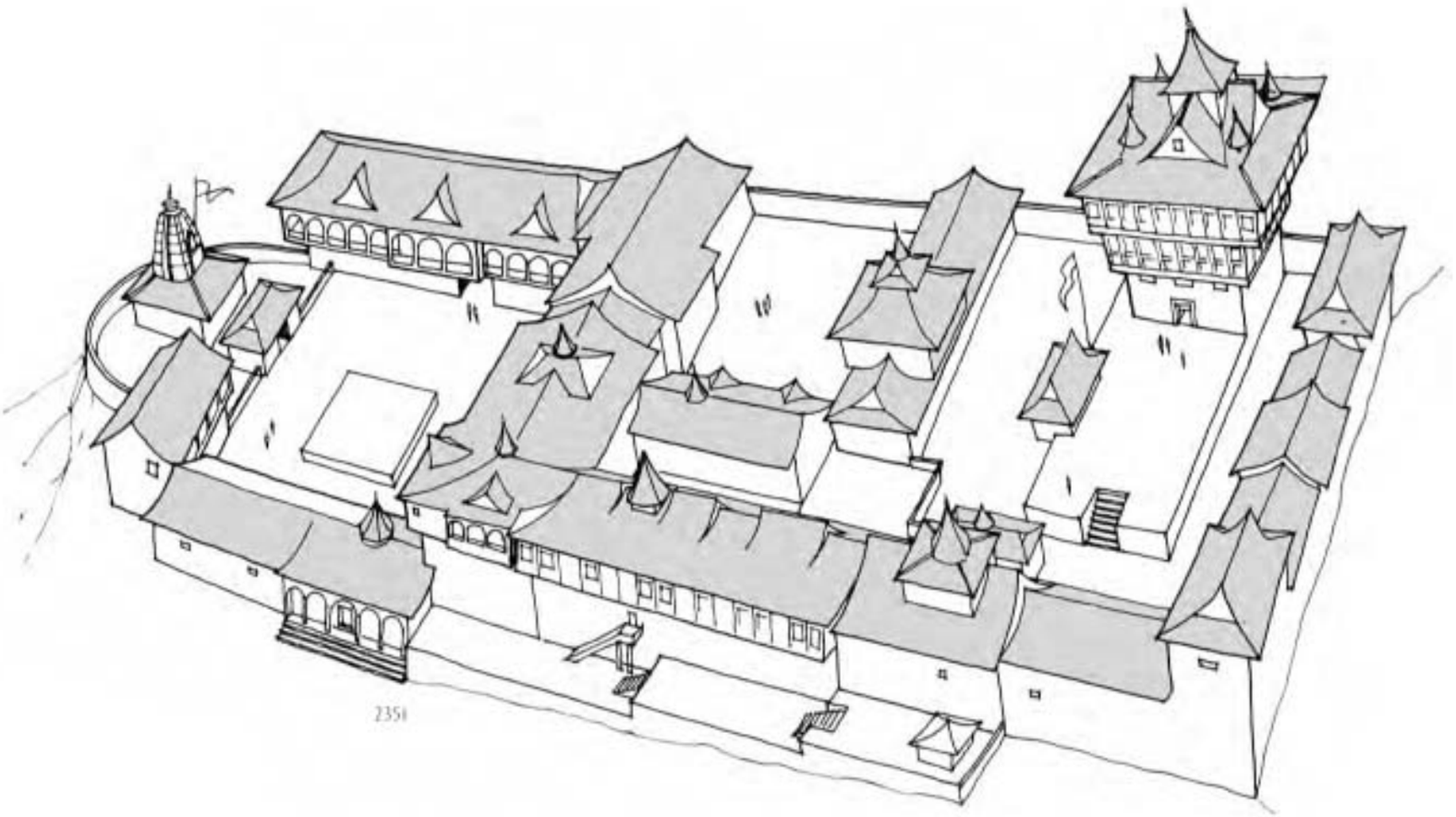
235e

235f

235g



235h



235i

Typology of wooden and *wood-and-stone* temples

The following is the typology of the temples in wood visited by the SID team. These are the different types of wooden and *wood-and-stone* temples that have been categorized by their roof forms and elevation characteristics. We observed and documented, in varying degrees of detail, six distinctive types of temples on the two field trips to Himachal Pradesh (figure 234). This is in no way an exhaustive study, however the descriptive differences of these wooden and *wood-and-stone* temples adds to our knowledge about the variation of built forms existed throughout a long period of time in a remote landscape. Using the roof type as a prime criteria for this typology, we studied the simplest to the most complex temples in wood (figure 235).

236a

236b

235 (a to i). Roof types of temples, Himachal Pradesh. (a) Gable roofed Lakshana-Devi temple in Bharmaur village, (b) Pent roofed large-size granary temple in Old Jubbal Village, (c) Pent-and-gable roofed middle temple in Old Jubbal village, (d) Pent-and-gable roofed temple at *Chaurasi* temple complex in Bharmaur village, (e) Pent-and-gable roofed temple in Kiari village, (f) Composite roofed temple in Khaneti village, (g) Tower temple in Jhaknoti, village, (h) Multi-tiered pyramidal temple at Prashar Rishi lake in Mandi district and (i) Bhimakali Tower Temple in Sarahan town, Sutlej valley. In Bhimakali temple, the main temple is a Tower temple while in the temple complex, there are examples of many roof types from pent to pent-and-gable to composite roofs.

236 (a, b). Pent Roof temples. The Shiva Temple (a) and Mahasur Devata Temple (b) at Old Jubbal Village. Both these temples show the pent roof with golden metal pot at the top. There are three smaller temples with gable roof next to Mahasur Devata Temple.

The types of temples based on their style of the roof are: 1. Gable roof, 2. Pent roof, 3. Pent-and-gable roof, 4. Composite roof, 5. Tower temples, 6. Multi-tiered pyramidal roof

Gable roof

In Himachal Pradesh, the majority of the gable roof temples are single-storey structures built on a solid stone plinth. One notable example of a gable roof temple we observed is the Lakshana-Devi temple at Bharmaur (figures 219, 234, 235a). This type of temple is developed around a small sanctum with a circumambulatory path on its periphery and a wide enclosed *verandah* on the entrance side. The roof ridge runs parallel to the longer wall of the form. The gable slope is achieved with use of only horizontal members and no diagonal members are employed. In terms of construction, these are the simplest temple structures in Himachal Pradesh.

The gable form is similar as in vernacular houses; the major difference being the orientation of the entrance. In temples of this type, the main entrance is below the gable at the narrow end, whereas in houses it is in the longer wall under the edge line of the roof. Another smaller scale temple of this kind was found in the Old Jubbal village near Mahasur Devata Temple (figure 221). Most of these temples are situated in high-altitude areas and their high-pitched gable roofs protect them during heavy snowfall.

Pent roof

Pure pent roofed temples in the western Himalayan region are rare – perhaps no more than a couple still exist[4] (figures 234e, 234f, 235b). We were lucky to observe and measure draw one of these temples. Little temple in Old Jubbal (refer Part 3 on page 206) that is a sub-section of the granary has pent roof. Built like the miniature versions of the larger and more complex houses, the use of this roof type is a reflection of the building scale. The four equal sides of the roof rise to a single point and appear as a mountaintop, the peak of the worship space for the Gods. On the four corners of these curvilinear pent roofs, we observed the wooden member with carved edges, similar to that of pent-and-gable roof. The Shiva Temple (figures 220, 236a) and the Mahasur Devata Temple (figures 221, 236b) within the same village also exhibit the pent roof capped with golden metal pots (*kalash*, locally known as *paru* or *andas*). Fencing and the instruction plaques for use of the space clearly indicate the local community management of the temple.

241

241. Shakti-Devi Temple, Chhatrari Village, Chamba District. The Archaeological Survey of India (ASI) conserves this historic temple, which has elaborate carvings and wall paintings. The primary structure of this composite roof temple is made of wood and the slate stone is mainly used as tiles in the roof and slabs in the plinth. It is housed within a complex located in the heart of the Chhatrari village (refer figure 26).

242. Children at Shiv-Shakti Public School, Chhatrari Village. Inside the temple complex, there is also a school made with local materials. Children of various ages study here, surrounded by ancient examples of their culture.

Measure drawings of a wooden temple

Nearly one hundred years ago in 1910, James Fergusson, the noted British Architect, wrote about the wooden temples of the Himalayas:

"No one has thought of measuring them, nor of enquiring into their age or traditions; and till this is done it is impossible to treat them in anything like a satisfactory manner." [9]

Shakti-Devi Temple, Chhatrari

Permission: Archaeological Survey of India (ASI)

Inspired by James Fergusson's words of almost a century ago, the SID team of 2005 field trip contacted the Archaeological Survey of India (ASI), who gave permission to document and measure draw the Shakti-Devi Temple (figure 241) in Chhatrari village (figure 26). This is an excellent example of wooden architecture created with the combined talents of the local people and the patronage of their King as well as the expertise of "Meruvarman's master craftsman, Gugga"[10], a master artisans brought to the remote site by the power of belief in the mountains' ability to house great Hindu deities.

After touring the temple and assessing the task of measure drawing, the SID team divided themselves into small groups to study the entire temple. One group took up the task of measuring the temple complex and second group dealt with the main Shakti-Devi Temple while others dealt with smaller temples in the complex and drawing the details and carvings of pillars, ceilings, and construction joinery. This is where the fine woodworking, exclusively used in temples, could be recorded. Along with the measure drawings, students made sketches to understand the effect of light on the interior spaces and to highlight imagery in the artistic woodcarving.

Photographs were also taken for reference so that the measure drawings could be completed back at SID, Ahmedabad with accuracy. In all, the students spent two days with the able assistance of the SID faculty members, ASI representative and the priest of the temple, carefully measuring without disturbing the sanctity of the space. Many of the local villagers were interested in this process of measuring and kept careful watch on our activities.

Temple complex

The main feature of the temple complex (figures 243, 247) is the Shakti-Devi Temple in the centre (figure 244) with its ornately carved entrance facing northeast. There are two other smaller temples within this complex. They are Shiva-Parvati Temple (figure 245) and Shiva-Linga Temple (figure 246). The Shiva-Parvati Temple with pent-and-gable roof follows similar spatial layout as the Shakti-Devi Temple but it is of much smaller scale and has less ornamental carving. The Shiva-Linga Temple is the smallest temple in the complex. It is open from all sides and covered from the top with columns supporting a gabled roof. The temple complex in its current configuration includes a school (figure 242), which is built using the traditional construction methods of the region. There were other locally constructed buildings at the periphery of the temple complex. The ground is paved throughout the temple complex. This space transforms itself into a community gathering centre during festivals and markets as well a becoming a sports ground in the late afternoon for the youngsters of the village.

242

251a

251b

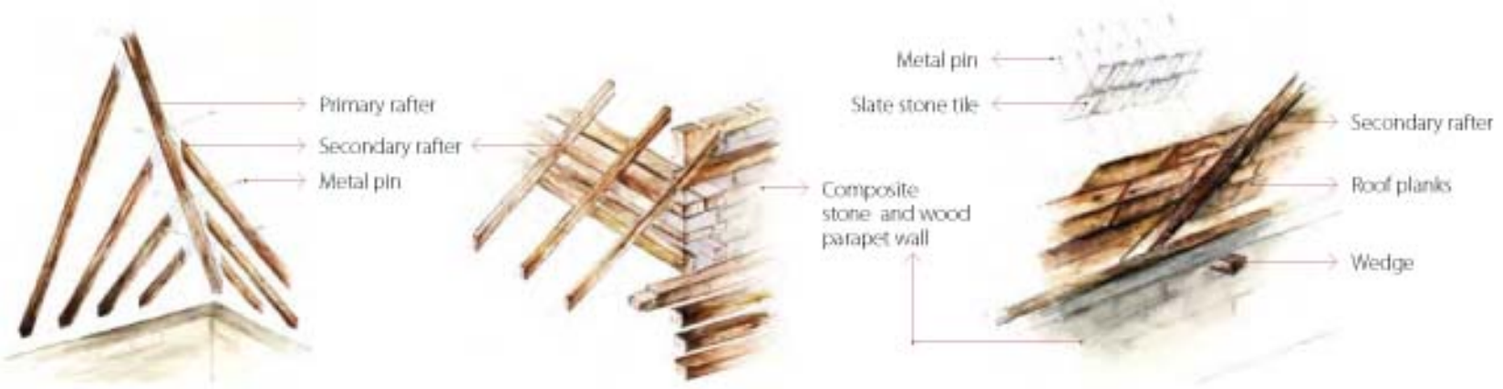
252

251 (a, b). Circumambulatory path columns, Shakti-Devi Temple, Chhatrari Village. These columns (a) of the circumambulatory path are the key structural members of the temple. Thickest in size and scale, they are the load-bearers of this wooden structure. The column base is supported on the sill beam forming a lap junction and the capital (b) supports the first floor beam, which also exhibits a cross-lap joint.

252. Roof structure details, Shakti-Devi Temple, Chhatrari Village. This view of the wooden roof structure shows low relief carving on the columns and cantilevered outer structure as well as a brief view of stone roof tiles. The outer column acts as a secondary support system to the roof structure.

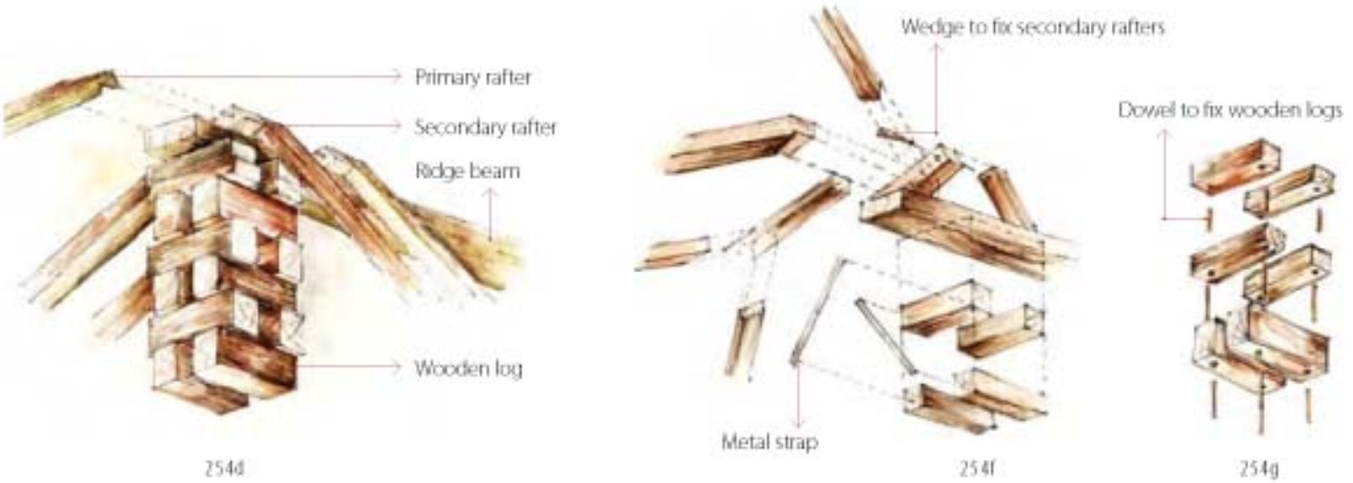
253. *Farque* columns of roof structure, Shakti-Devi Temple, Chhatrari Village. Inside the attic space, under the roof structure, there are *farque* columns constructed with wooden pieces reinforced with dowels and metal strapping. The metal strapping, also called 'flats' is probably a later addition to reinforce these columns. These columns supporting the entire roof structure rest on the tie-beams and are fixed with wedges to them.

253



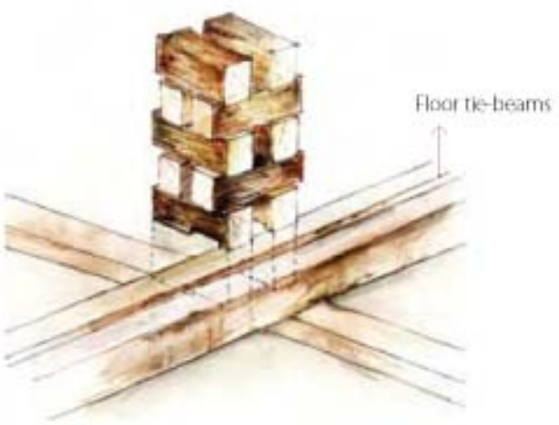
254a 254b 254c

Roof structure details



254d 254f 254g

254e



***Farque* column details**

254 (a to g). Roof details, Shakti-Devi Temple, Chhatrari Village. The primary rafters support the secondary rafters (a). This wooden framework supports the roof and it rests on the composite stone and wood parapet wall (b). The wooden planks are nailed to the secondary rafters (c) that are held in place on the parapet wall with a wedge. The slate stone tiles are laid and nailed with metal pins on this wooden planks. The most interesting feature is the *farque* column (d), which supports the primary rafters and ridge beam. This column rests on the floor wooden beams (e). The *farque* column is made with a pair of wooden pieces placed perpendicular to the next layer and fixed by wooden dowels (f). Such columns are also observed in the village houses. Illustrations: Devina Jesrani and Suhas L.

265

265. Watercolour illustration of Shakti-Devi Temple Complex, Chhatrari Village, Chamba District. A first year SID student, not part of the SID study tour, painted a watercolour illustration in Ahmedabad based on the photographs and drawings from Himachal Pradesh. Illustration: Vaidehi Parikh

Portfolio and analysis of Shakti-Devi Temple

The Shakti-Devi Temple (figure 265) is a living example of the persistence of a built form representing an intact belief system over a thousand years. Scholars have featured this example in their discussions of the wooden temples of Himachal Pradesh.[1] Although there are photographs from the last century and sketches dating back to the nineteenth century, we were unable to find any measure drawings of this temple. After twelve SID students completed their drawings in 2005, the *Mātrā* Team at SID Research Cell digitized their findings and started working on it. The Portfolio and analysis that is in the following pages is, the result of a year's work, of both standard and experimental digital drawings based on original research. Our curiosity to understand the layers of meaning of the temple as a built form from the inner sanctum to the recently updated roof led us to examine structure, volume, spaces, elements, details and views. We recreated the temple in three-dimensional digital models in order to look at the interior spaces and its composition through systematic articulation of the elements and its parts. This models aided in understanding and representing this configuration. The power of this sacred space comes through in these analytical deconstruction and reconstruction just as the additions, repairs, renovations and restorations have reinforced the religious identity of the built forms over generations.

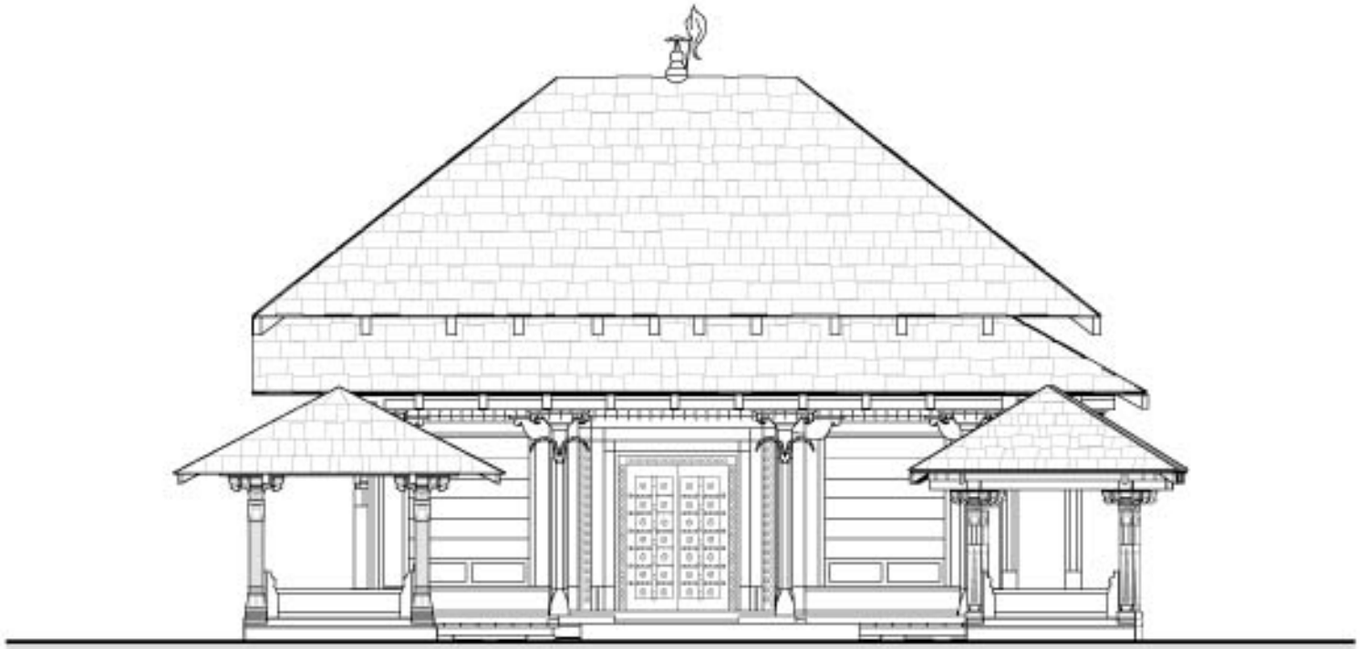
We present the portfolio with one overall plan and four sections of the Shakti-Devi Temple complex to give an overview of the entire site. This shows the orientation, relationship and the scale of the Shakti-Devi Temple to the two smaller temples immediately adjacent to the main structure, the Shiv-Parvati and Shiv-Linga Temples. We recognized that these three temples are the primary religious built forms in the complex.

The Shakti-Devi Temple is the prime focus of our portfolio and analysis. From this point of selection, we continue with detailed four plans (ground floor plan, reflected ceiling plan, roof soffit plan and roof top-view plan), four elevations and six sections of the Shakti-Devi Temple. The reflected ceiling plan shows the intricate woodcarving details, expressing the richness of the craft integrated within the built form. Shakti-Devi Temple is the most significant temple on this site in terms of its scale, quality and quantity of the woodcarving as well as in representing more deeper beliefs of the villagers of Chhatrari.

We created a rendered image of a section of the Shakti-Devi Temple indicating where and how wood and stone are used in the construction of this largest temple. A detailed longitudinal section with nomenclature gives a deep understanding of materials and its compositions to create profound interior spaces. As we did a material analysis in the Aukta House portfolio, here we are indicating the predominance of wood in the overall design of the built form. This also gave a feel of the interior spaces and their relation to each other. The first section of the portfolio is completed with a series of perspective views from all four sides of the temple. This section of the portfolio constitutes a standard presentation of measure drawings of a built form for an Interior Designer or an Architect. We wanted to use this as a base information for review before we started to deconstruct and uncover the elements and the parts of this built form.

Exploded views of structural elements of the temple are the next level of exploration in the portfolio. It begins with the three-dimensional drawing of the composition of spaces (sanctum, circumambulatory path, and three *verandahs*) of the Shakti-Devi Temple. Next to this drawing is the deconstruction of the two smaller front *verandah* in the anterior of this Temple. This is a detailed drawing with the nomenclature of the assembled parts. The same set of representation is applied to the main temple, which is presented with much more detailed drawing. There is a name for each element and its' parts. This is a design vocabulary for the Shakti-Devi Temple.

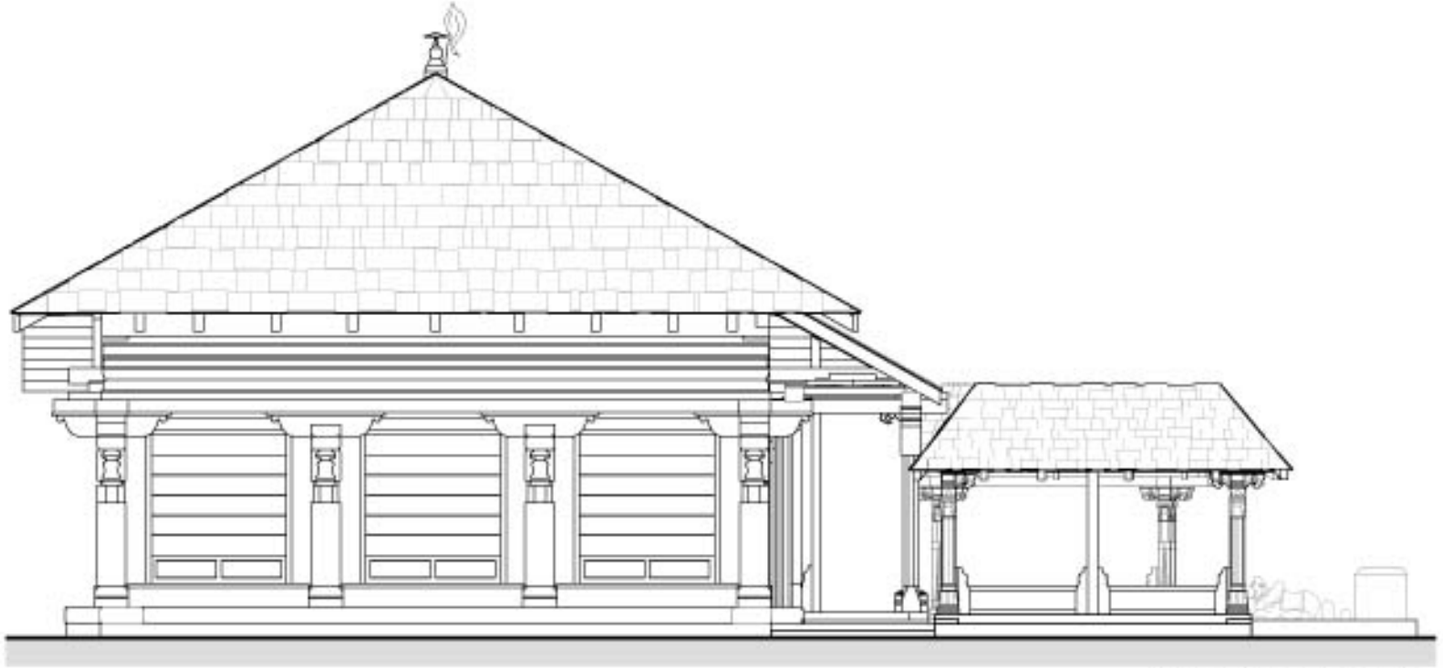
The wooden framework of the roof is a significant feature of the temple because of the variety of joinery and the use of the *fargue* column, local to Himachal vernacular built forms (refer figures 253 and 254 on page 240). We show a detail of the exploded view of the roof along with all of the possible smaller junctions. This is followed by an examination of the two main doors in the temple beginning with the outside door and



271a

© SID Research Cell, CEPT University, India

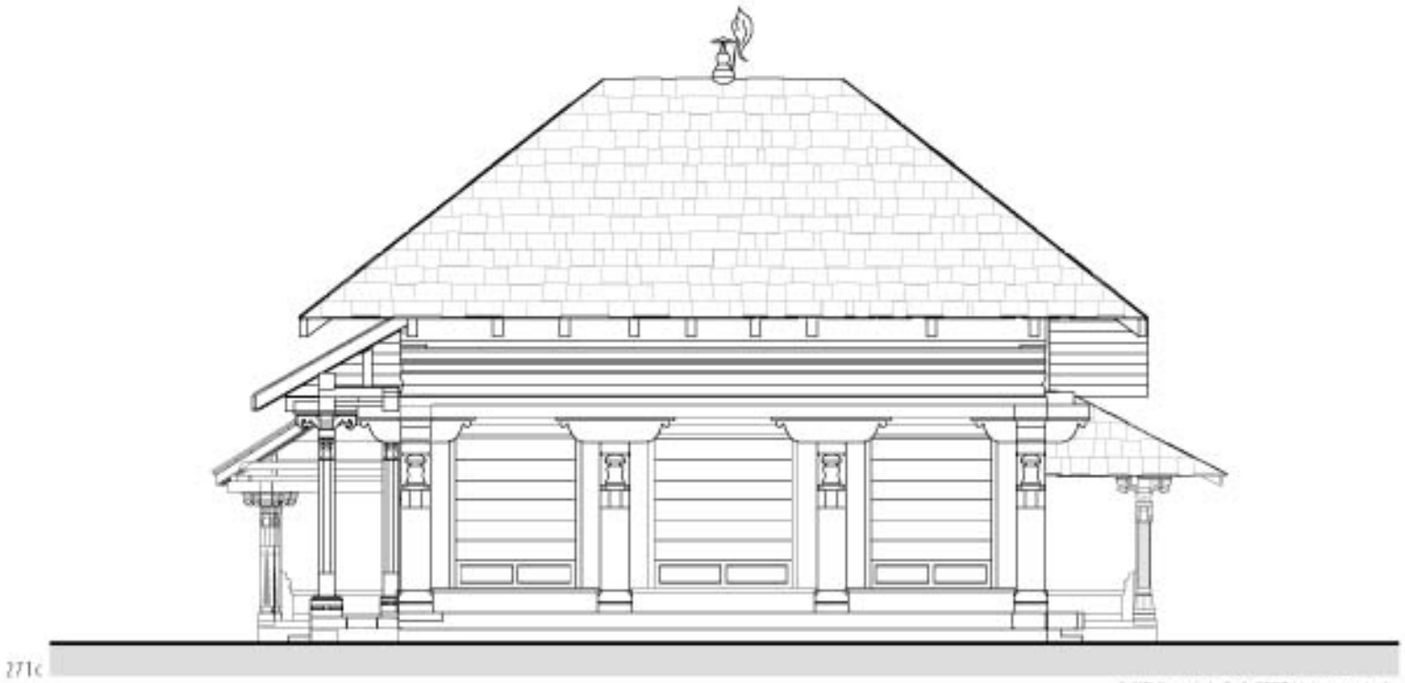
Shakti-Devi Temple north-east (front) elevation



271b

© SID Research Cell, CEPT University, India

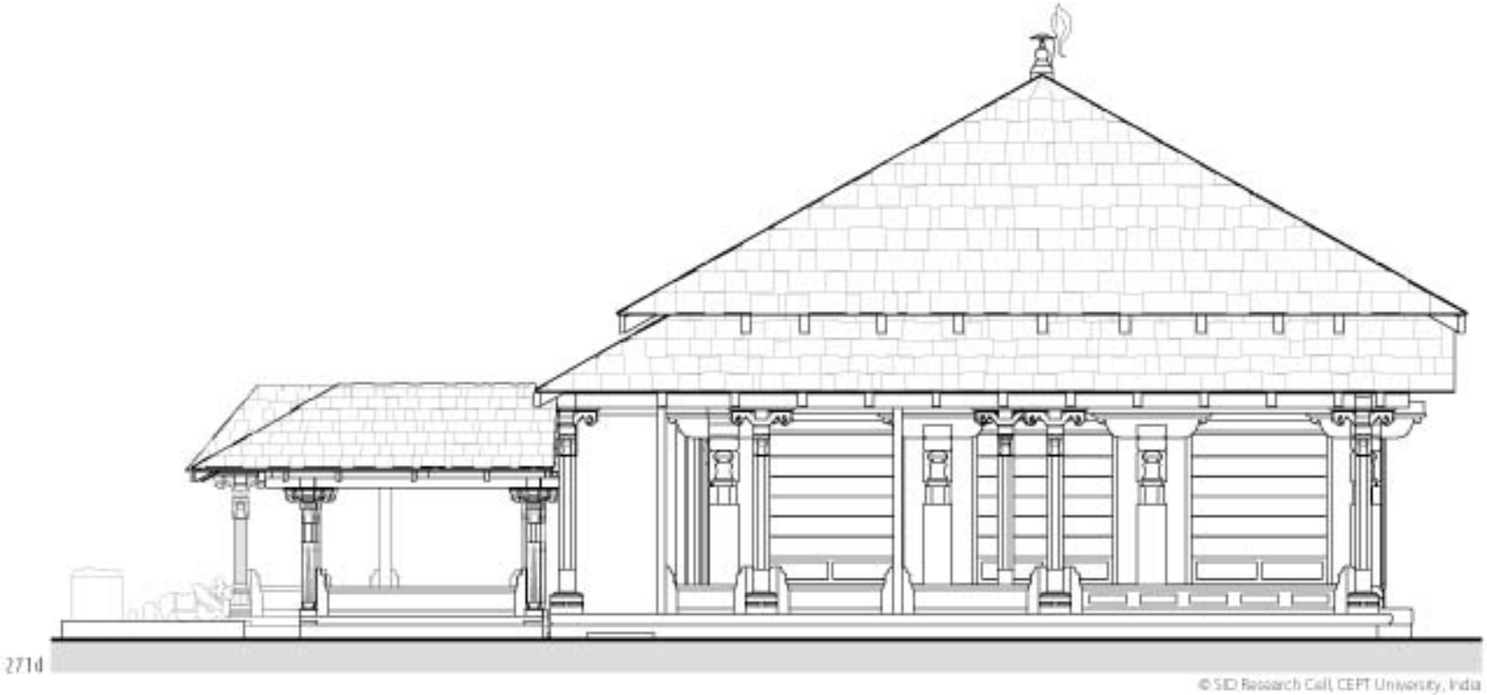
Shakti-Devi Temple north-west (side) elevation



271c

© SID Research Cell, CEPT University, India

Shakti-Devi Temple south-west (back) elevation



271d

© SID Research Cell, CEPT University, India

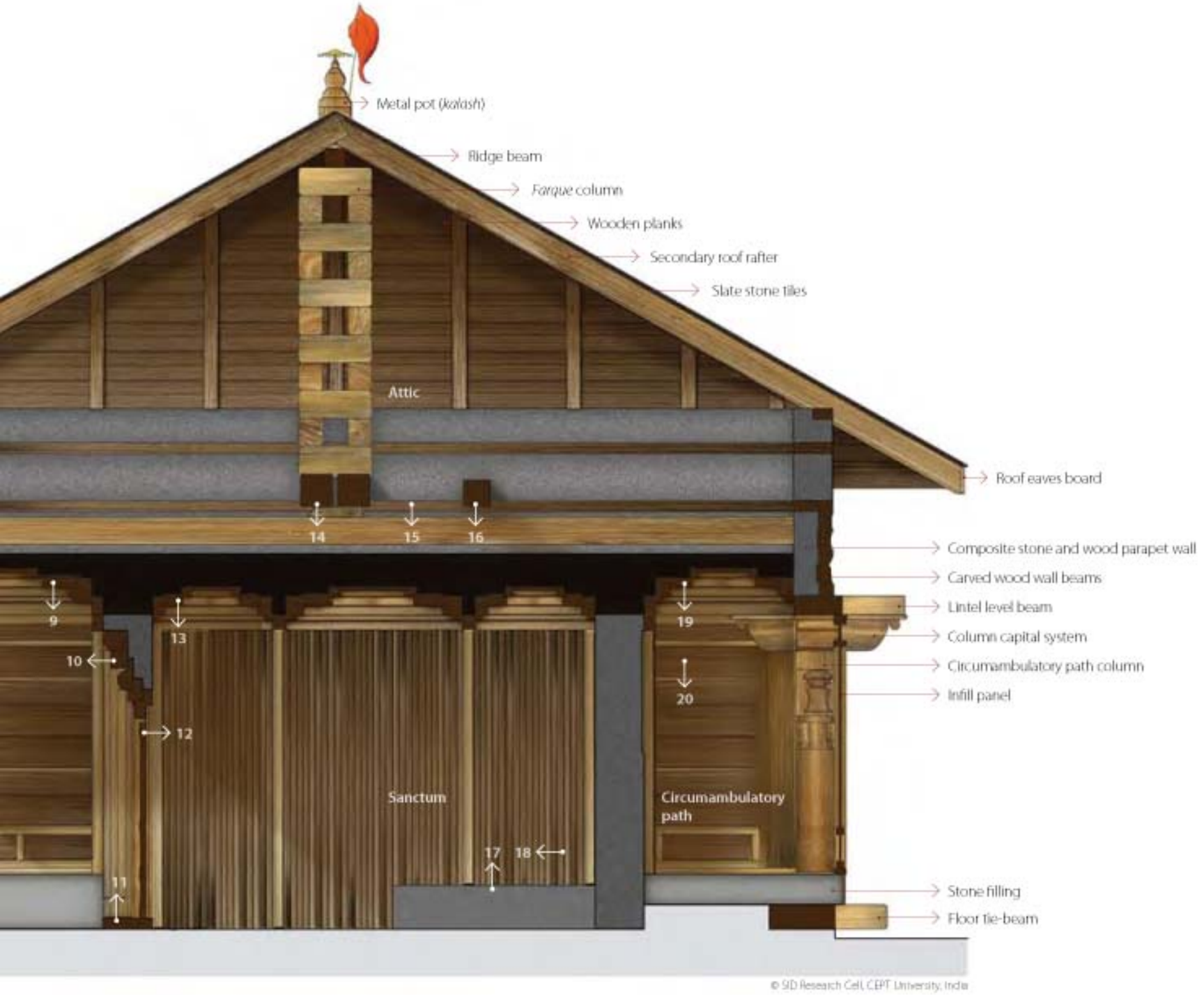
Shakti-Devi Temple south-east (side) elevation

0.5 0 1.0 2.5 metres

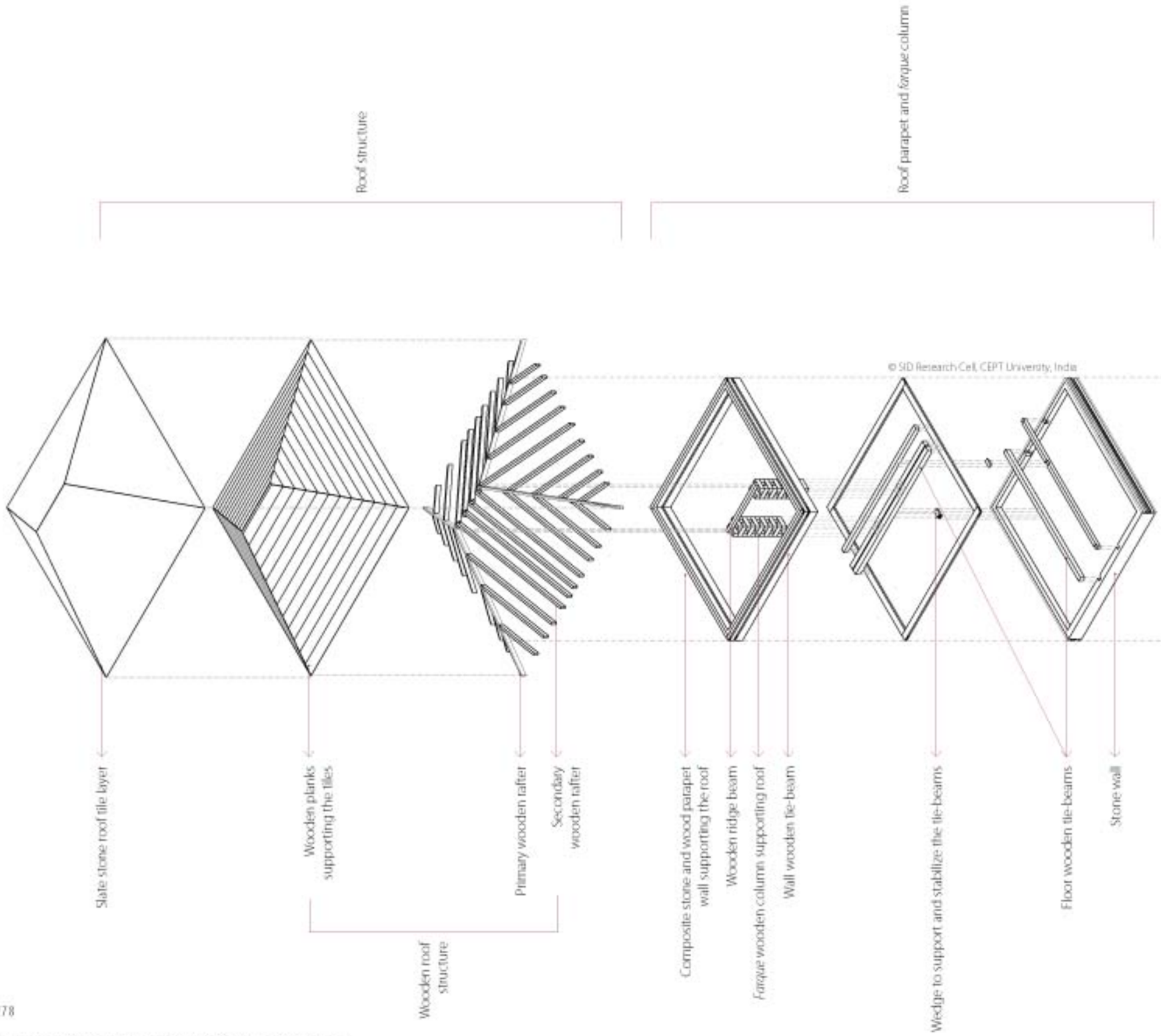
1. Sand pit
2. Stone steps
3. Balcony *verandah* beam
4. Balcony *verandah* ceiling
5. Entrance door frames
6. Metal rondelles
7. Entrance door threshold plank
8. Entrance door shutter
9. Circumambulatory path carved wooden ceiling
10. Sanctum door frames
11. Sanctum door threshold plank
12. Sanctum door shutter
13. Sanctum carved wooden ceiling
14. Tie-beam supporting *farque* column
15. Composite wall tie-beam
16. Tie-beam
17. Stone base for idol
18. Wooden panel cladding
19. Circumambulatory path carved wooden ceiling
20. Infill panel

275

Rendered section of Shakti-Devi Temple

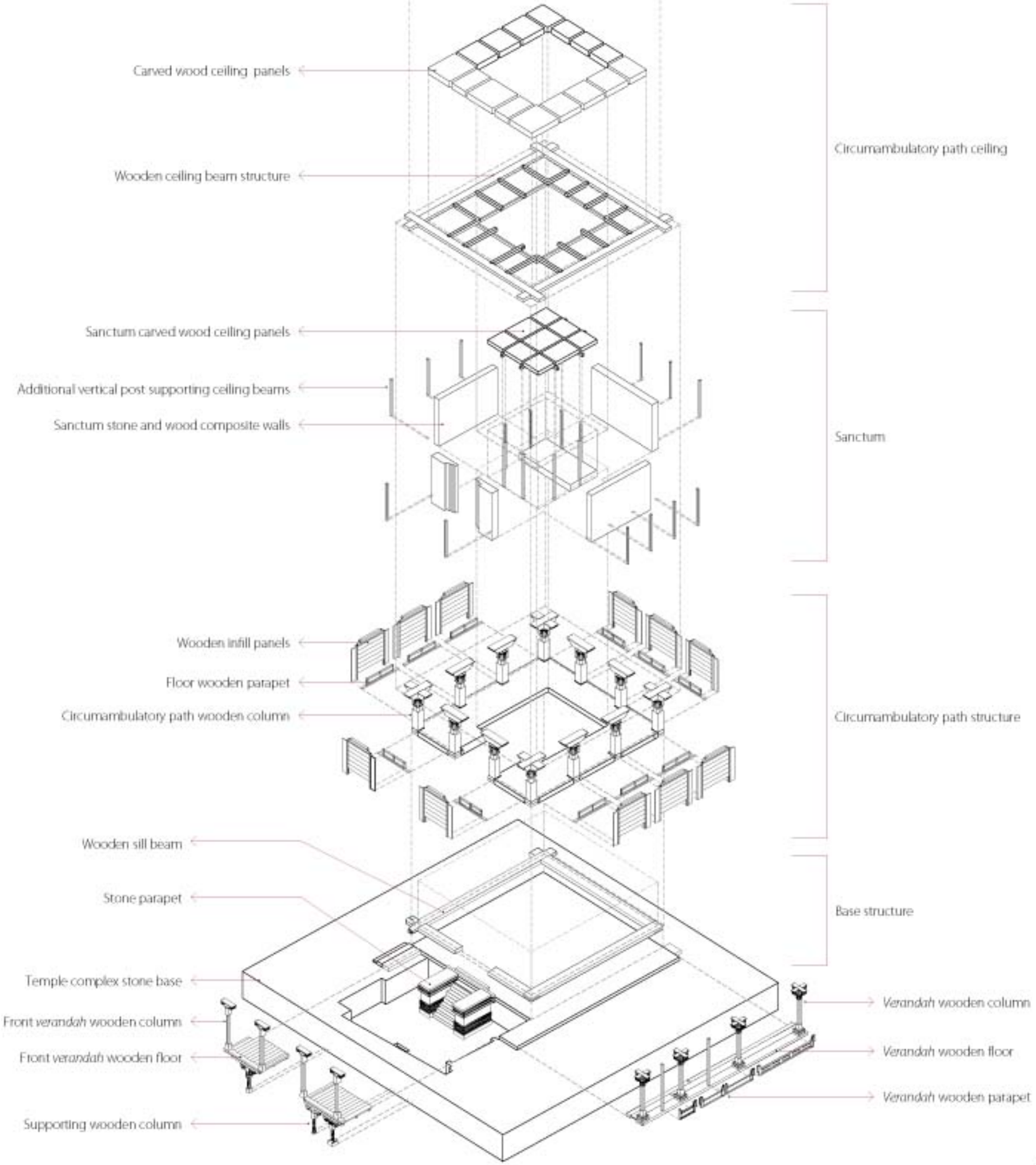


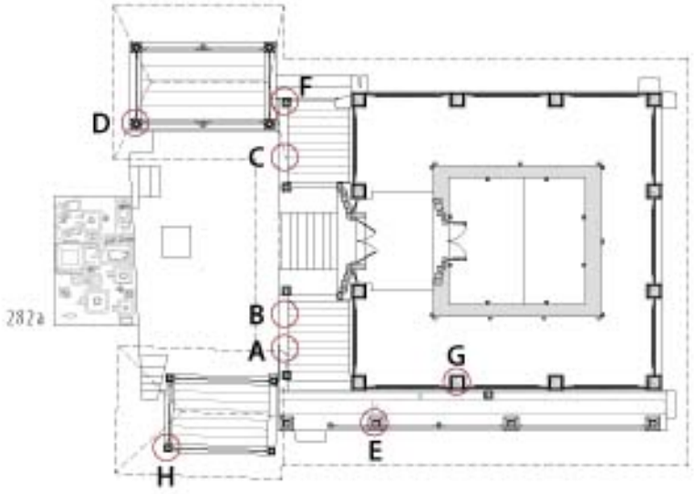
© SID Research Cell, CEPT University, India


Roof structure
Roof parapet and *fargue* column
© SID Research Cell, CEPT University, India
Slate stone roof tile layer
Wooden planks supporting the tiles
Primary wooden rafter
Secondary wooden rafter
Wooden roof structure
Composite stone and wood parapet wall supporting the roof
Wooden ridge beam
Fargue wooden column supporting roof
Wall wooden tie-beam
Wedge to support and stabilize the tie-beams
Floor wooden tie-beams
Stone wall

278

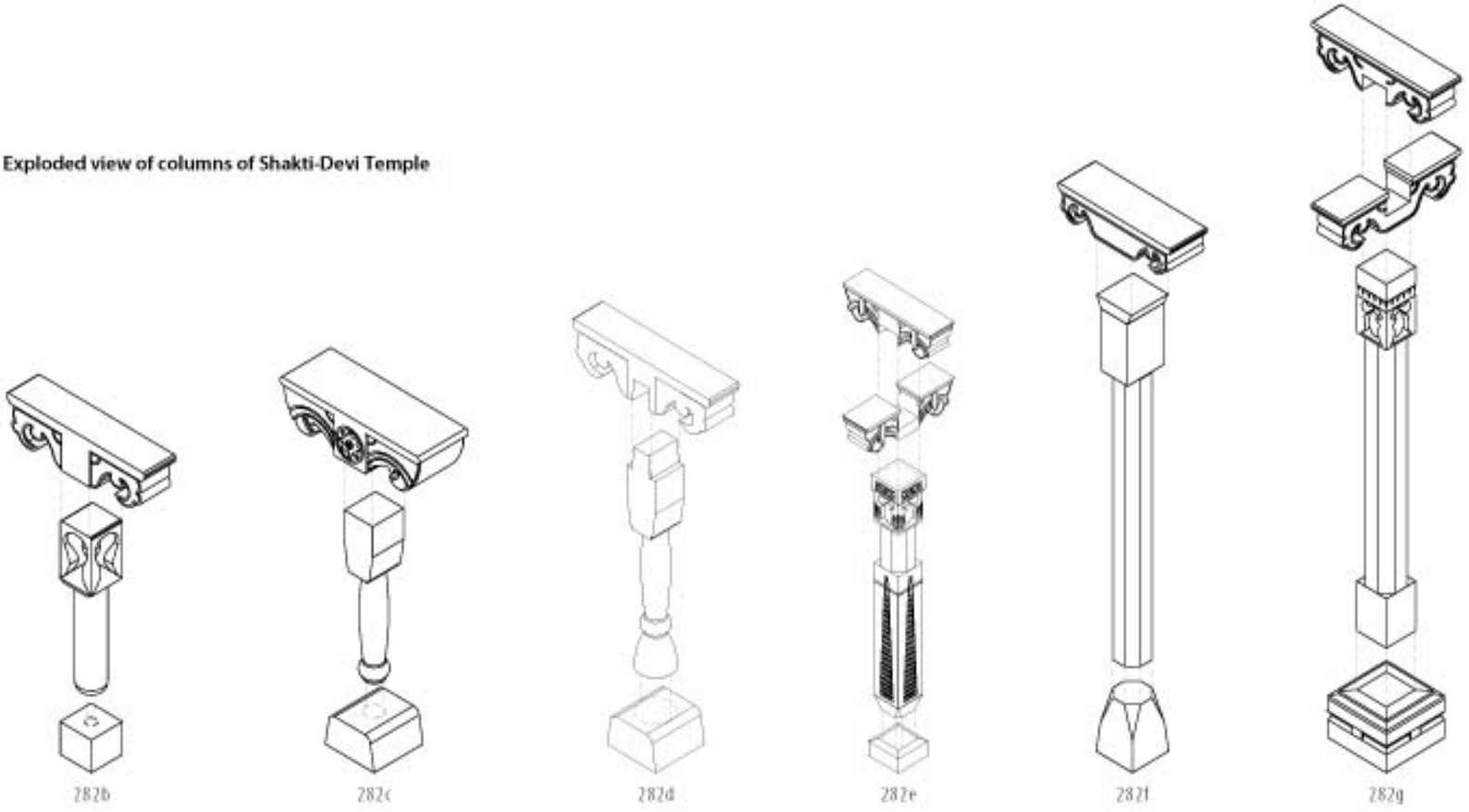
Exploded view of main structure of Shakti-Devi Temple


Carved wood ceiling panels
Wooden ceiling beam structure
Circumambulatory path ceiling
Sanctum carved wood ceiling panels
Additional vertical post supporting ceiling beams
Sanctum stone and wood composite walls
Sanctum
Wooden infill panels
Floor wooden parapet
Circumambulatory path wooden column
Circumambulatory path structure
Wooden sill beam
Stone parapet
Base structure
Temple complex stone base
Front verandah wooden column
Front verandah wooden floor
Supporting wooden column
Verandah wooden column
Verandah wooden floor
Verandah wooden parapet

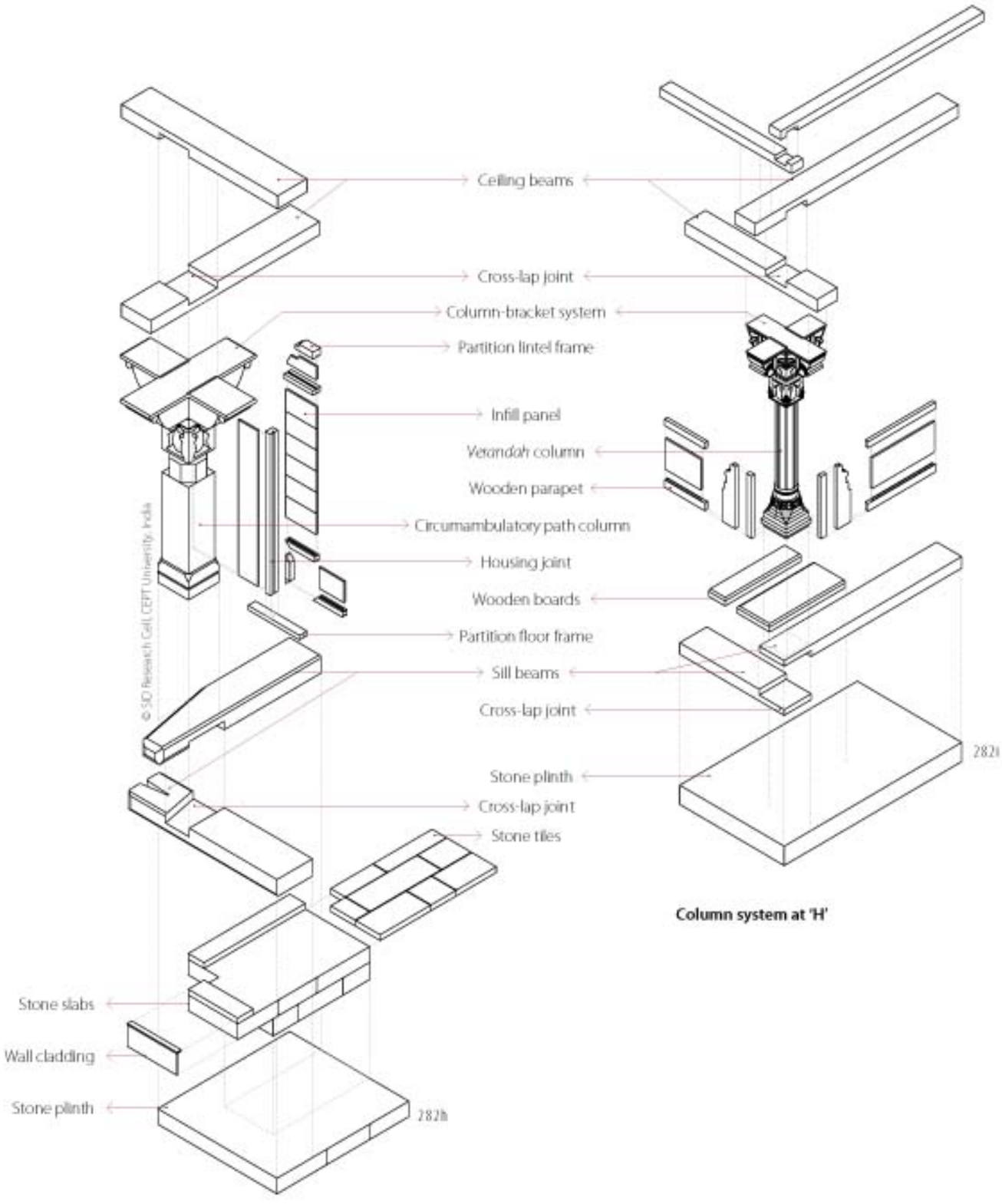


Key plan of Shakti-Devi Temple indicating positions of columns

Exploded view of columns of Shakti-Devi Temple

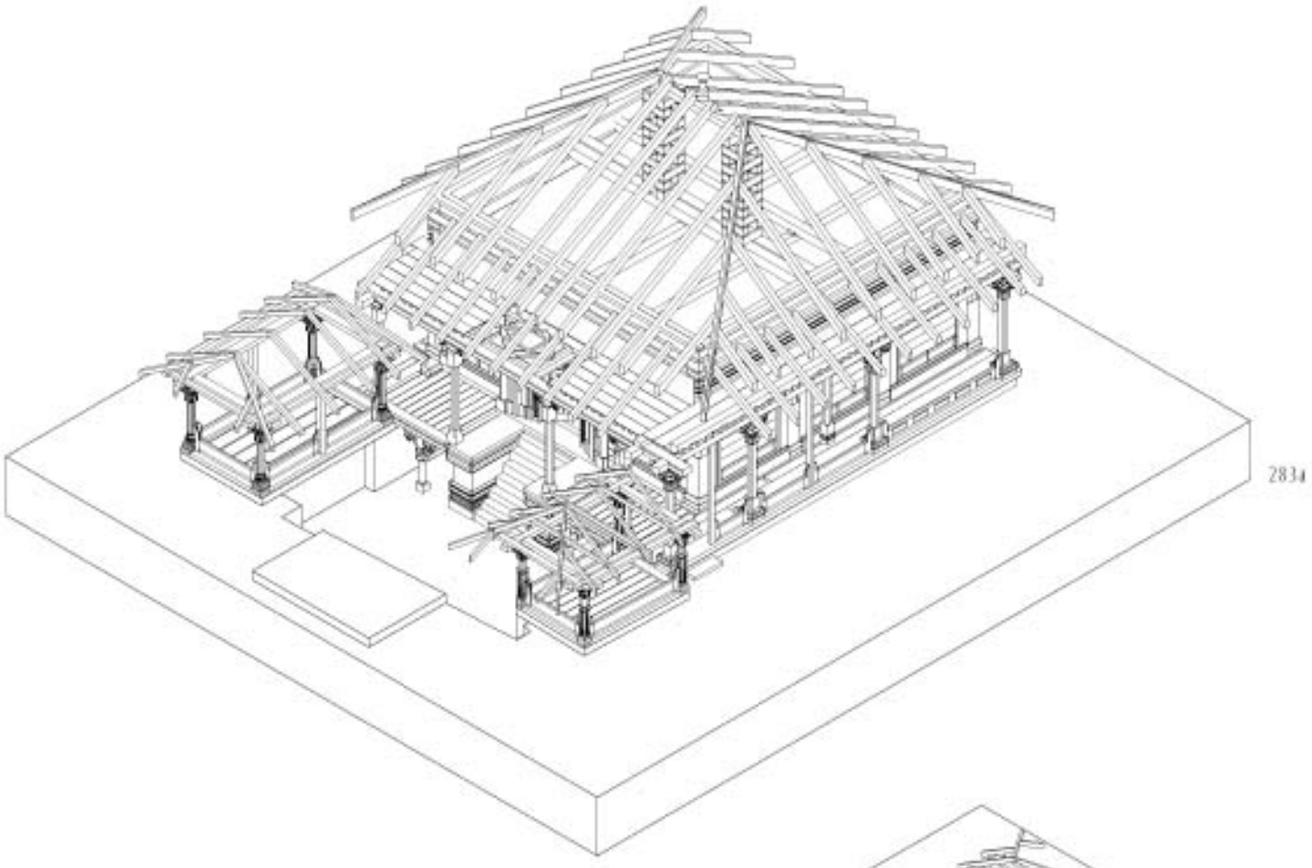


Column at 'A' | Column at 'B' | Column at 'C' | Column at 'D' | Column at 'E' | Column at 'F'

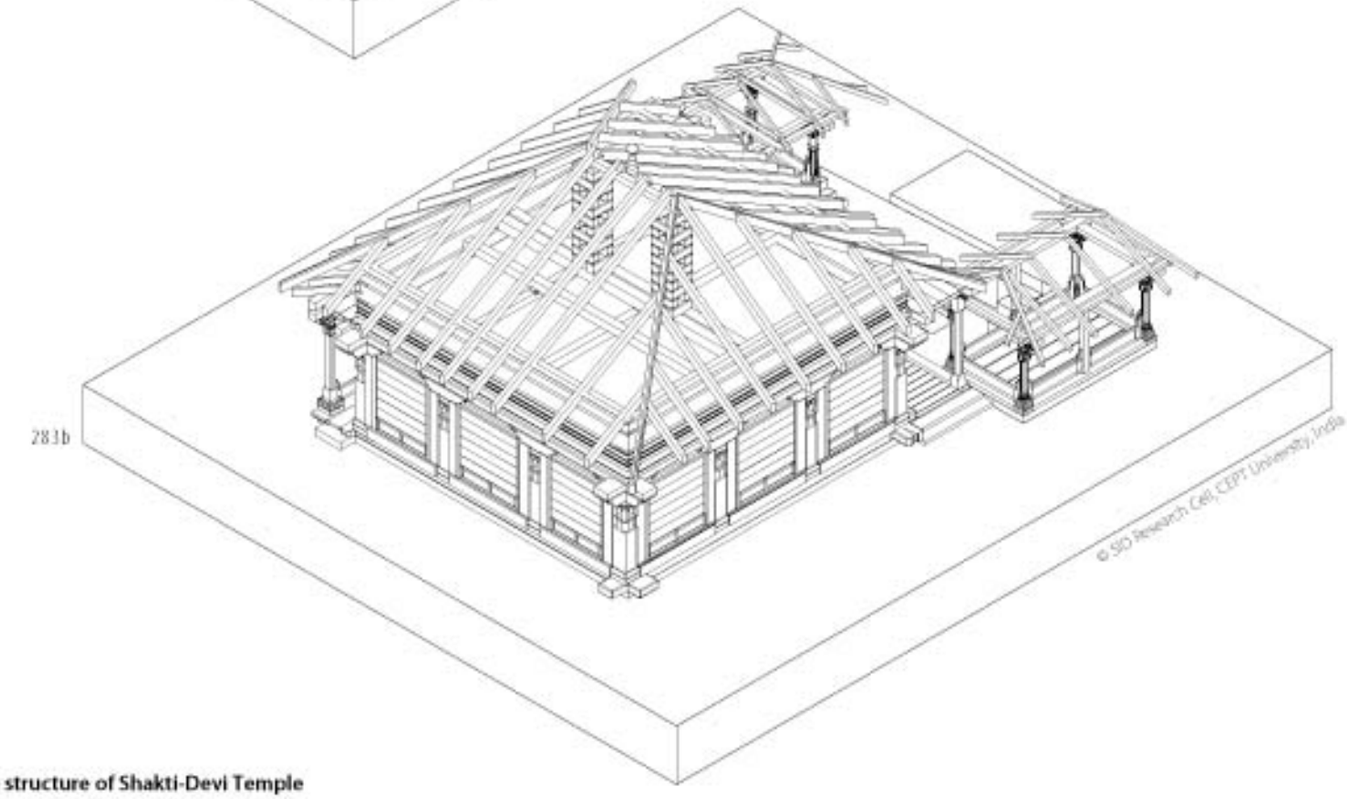


Column system at 'H'

Column system at 'G'



283a



283b

© SID Research Cell, CEPT University, India

Isometric view of wooden structure of Shakti-Devi Temple

© SID Research Cell, CEPT University, India

284b

Rendered cut-out west view of Shakti-Devi Temple